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Automobile
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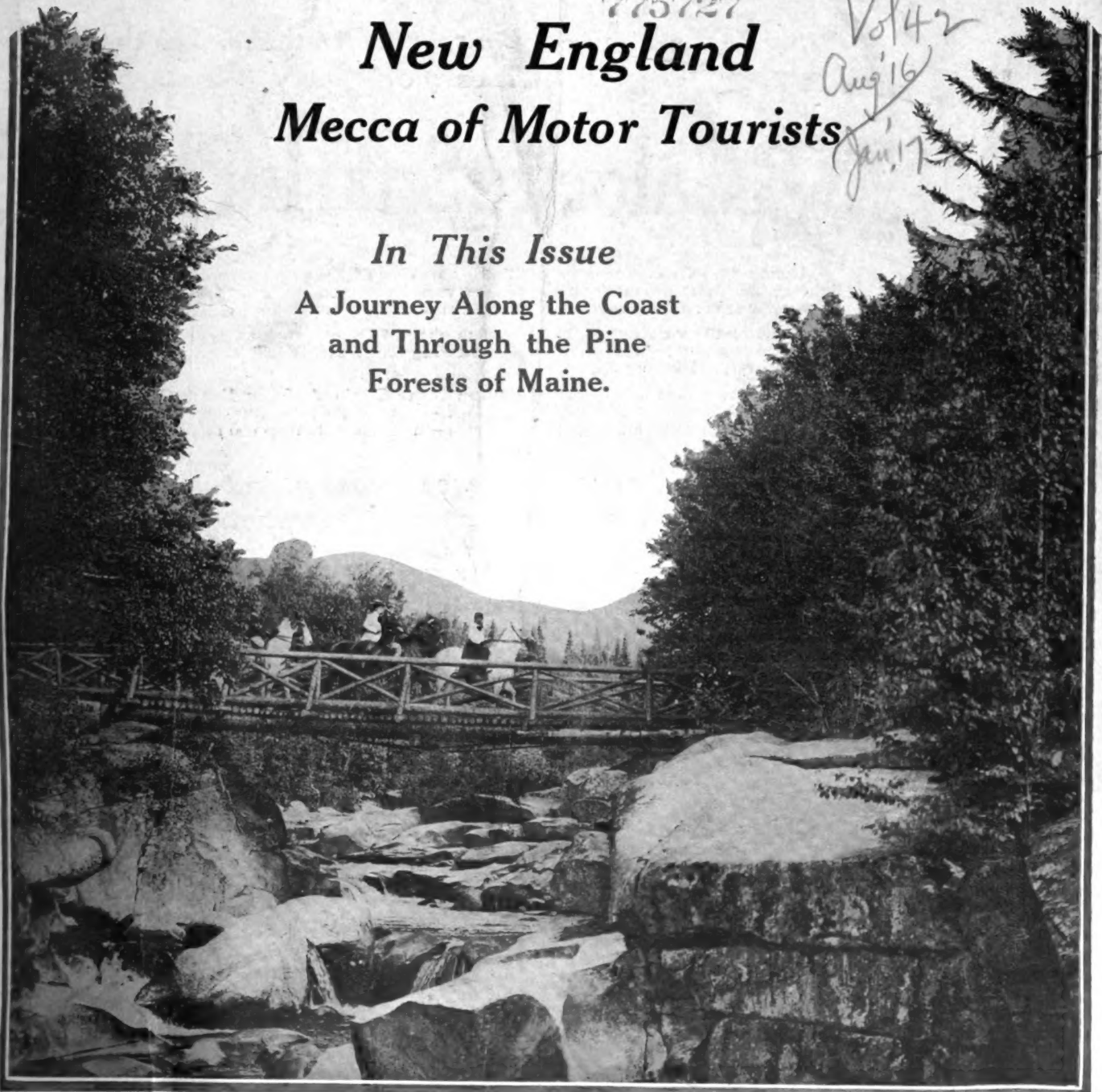
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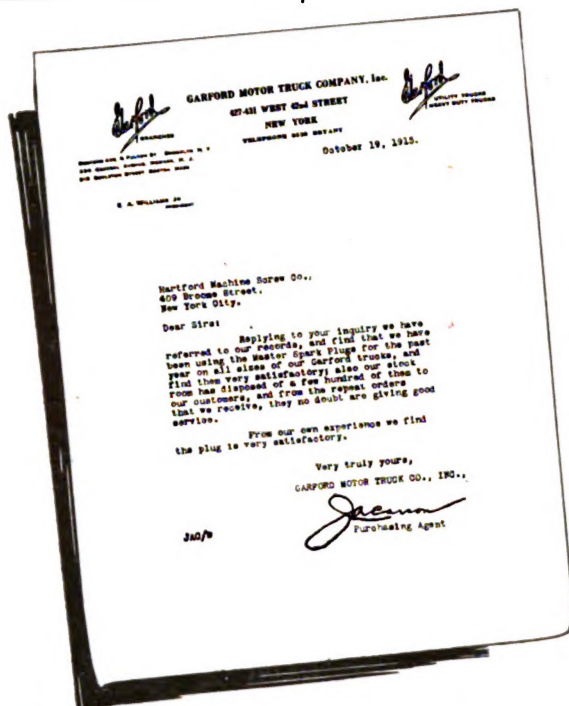
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*Vol 42
Aug 16
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New England Mecca of Motor Tourists

In This Issue

A Journey Along the Coast
and Through the Pine
Forests of Maine.





**“From the Repeat Orders”
—“The Plug is Very
Satisfactory”—**

Read the entire letter from the

Garford Motor Truck Company
—of New York—

It is a splendid testimonial to the
efficiency of

MASTER Calorite Spark Plugs

It makes no difference to what kind of service these plugs are subjected—In the lightest cheapest pleasure car or the heaviest most expensive Limousine—In light delivery wagons or the heaviest trucks—In taxicabs—In motor buses.

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So when a concern with the reputation of the *Garford Motor Truck Company*—of New York endorses Master Spark Plugs—It is evidence of the fact that—These Plugs with our guarantee of genuine service—make an instant appeal to discriminating buyers—

***Motor Truck Efficiency is dependent upon
consistent uninterrupted operation—***

Master Calorite Spark Plugs—are insurance against delays in delivery schedules—

A hot fat regular spark is certain in every cylinder of the engine—assuring a sweet running motor and keeping the car on the road—in constant operation—

Without the annoyance of broken or fouled insulators—Carbonized or burned points—Leakage of compression—thro or around the plugs—

Master Calorite Spark Plugs are backed by the manufacturers with one of the broadest guarantees given a spark plug—

“We guarantee MASTER CALORITE SPARK PLUGS against defects of material or workmanship, and will replace free of charge, any CALORITE insulators broken by heat, which are returned to us transportation prepaid.”

SIX STYLES—Half-Inch Regular; 7-8" Regular; Metric; Model “F” for Fords and Reos; 7-8" Long; Half-Inch Long.

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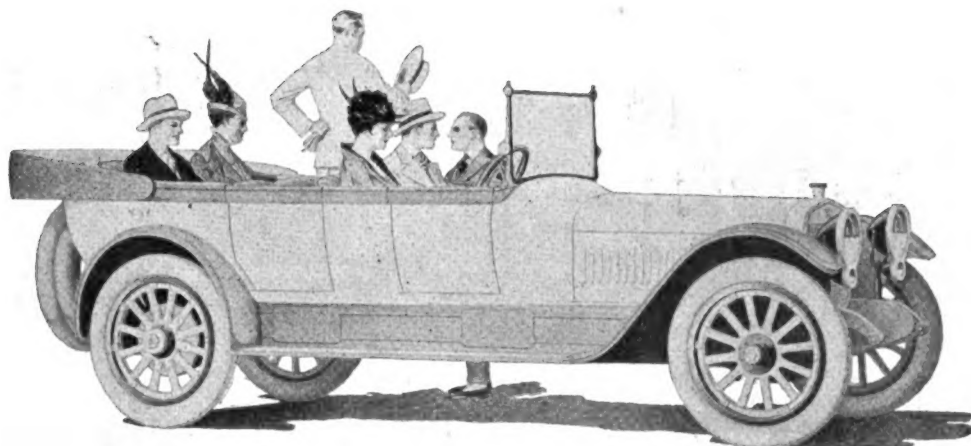
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**MASTER CALORITE
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EXTRA LONG
\$1.25 each retail

WINTON SIX



“Oh, I Didn’t See You”

How many times have your motoring friends said that after you had passed them out riding? And how surely it seems that your car is lacking in distinction.

Mere mechanical goodness in a motor car isn’t enough. Automobiles have a social importance beyond that. Appearance counts tremendously, because well informed people know that only the really superior cars ever possess distinctive individual beauty. Monotonous similarity of appearance indicates low grade.

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The Winton Company

131 Berea Road, Cleveland, Ohio.

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These are the claims of thousands of motorists,—some with years of experience,—who want full value, and more who know the value of high grade lubricants, and who know when they obtain satisfaction.

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It is sold in sealed containers.

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AND SUPPLY CO.**

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Motor Truck

Published Once a Month

*A Magazine for the
Motor Truck Owner*

**TIMES BUILDING
Pawtucket, R. I.**

Accessory and Garage Journal

A Distinct Trade Publication

25,000 Copies

Each Monthly Issue

**TIMES BUILDING
Pawtucket, R. I.**

CHURCH ENGINEERING COMPANY

Industrial and Mechanical Engineers, 1223 Filbert Street, Philadelphia. Develop, Market and Finance Patents. Reorganize Industries.



It's the same old COES

How often have you heard the repairman, machinist or shop manager say, "It's the same old Coes, just as good as the day I bought it—it will last forever."

That is evidence of the quality that has made Coes wrenches the standard the world over.

Coes Wrenches made today are just as good as the Coes Wrenches produced 50 years ago.

The material is selected with the same care, made by equally experienced and trained wrench makers, in a factory which specializes in wrench making. The wrenches are finished carefully and many times tested to assure the quality that will meet every requirement placed upon them.

Car owners who know wrench values demand the Coes. It is most popular with automobile repairmen, and in every other line of mechanical work Coes Wrenches will be found on the benches and in the tool kits of the expert workmen.

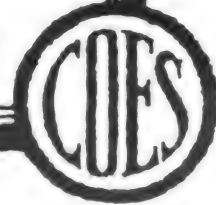
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Treasurer - - WILLIAM H. BLACK

Secretary - - - D. O. BLACK, JR.

Published the 10th and 25th of each month by the

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THE importance of farm tractors in the economic scheme of modern life is clearly shown in the leading article of this issue, and is being demonstrated to agriculturists of the middle west by an association of tractor manufacturers who are carrying on the demonstrations for the purpose of education rather than to do business immediately. Everyone, motorist or pedestrian, should be interested in the development of the agricultural tractor, for its adoption and operation by the farmers of the country means not only much larger crops, but that they can raise them at a lower cost than by animal power, which ought to result in lower cost to the ultimate consumer.

EVERY Motorist will be interested, if not enthusiastic, in the movement on foot to establish comfort stations throughout the country for the benefit of motor car operators. While the plan may never materialize to the grand extent proposed by the sponsors of the idea, the promulgation of such a plan can only serve to benefit motorists generally by directing attention to the lack of such conveniences in towns strange to tourists and possibly causing better arrangements to be made. That there is pressing need for some such public establishments there is no denying.

THE Mechanical Editor finds it necessary to again direct the attention of correspondents to the necessity of signing their letters with their full names, and to giving full details concerning the component or system about which they inquire. He is prepared to answer the most complex or the most trivial question concerning motor cars, promptly and comprehensively. If answers are desired by mail the writer should so specify and enclose a self-addressed, stamped envelope.

THE Readers of this magazine are exhibiting much interest in the stories concerning private garages, which have appeared in recent issues. Several inquiries have been received, the writers seeking information about the best type to build under certain specified conditions that obtain on their premises and the most practical material to use. The Editor is glad to answer these inquiries, and urges all subscribers contemplating the erection of a garage to ask for any advice needed. The service is free and authoritative.

THERE is a Great Sermon, applicable to every day life, to be found in the reduction of car prices by the Ford company at a time when labor and materials are at the highest levels ever known in the automobile industry. On analyzing the factors in the case, one finds that it is because Ford has always "hewn to the line;" that is, he began with an idea and has steadfastly held to the course he had mapped out, not wasting a moment or a movement in useless wanderings from the path. In this way he has built up a tremendously efficient organization, which enables him to produce cars in such numbers as to admit of low selling prices.

TOURING Through Maine is the subject of the motor car tour in this issue. There is no more picturesque and few more historic sections of the country than the Pine Tree State, which is the reason why such a large preponderance of tourists are journeying in that direction this year. It has been the playground of the man of moderate means, as well as the millionaire, for decades, and because of its generally excellent road system in the southern portion has become one of the most attractive grounds for motor car tours.



A WORTHY ASSOCIATE OF THE MORE EXPENSIVE CARS
TRANSPORTATION PLUS

You can almost order motor transportation sight unseen these days—and get it—if you are looking for just transportation.

But if you wish transportation **PLUS** Power, Pep, Punch, Style and Economy, you will go far and fail to find a value that can equal the Regal 4-Thirty-two for quality.

Are you looking for the Roomiest, Easiest-Riding car that you can find at a low price? See the Regal.

You will see in it, too, the Biggest motor, with **MORE** power than any car in the light-weight class.

You'll find that it squeezes the last drop of efficiency out of every gallon of gasoline.

And it will pull praise from every member of the family for its graceful lines and trim upholstery.

Our dealers all over the country tell us that the car sells on its looks and stays sold on its performance.

We have every reason to believe that the Regal 4-Thirty-two is the best merchandising opportunity in its class for the 1917 season. **WRITE.**

\$695

REGAL MOTOR CAR COMPANY (DEPT. B) DETROIT, MICH.



Regal 4-thirty-two

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What 1,000 Cars a Day Make Possible

This latest Overland development again emphasizes the enormous economy of enormous production.

No one has ever before made 1,000 a day of cars of this size and class—nor half that many.

1,000 cars a day enable us to use materials of a much higher quality and not only permit but actually enforce an accuracy of workmanship which smaller productions of cars in the same price range neither permit nor require.

1,000 cars a day make possible better, larger, much more comfortable cars than have ever before been possible at anywhere near the price.

This newest Overland is the largest Four ever offered for so low a price.

In the first place, note the longer wheel base—112 inches.

The enbloc 35 horsepower motor which has made the Overland famous is continued.

True—it is perfected even more and now it is a fitting climax of the experience obtained from a quarter of a million of these Overland motors in daily use.

Shock absorbing cantilever type rear springs are a big improvement.

The New Four

Model 85-4

35 horsepower en bloc motor
112-inch wheelbase
32 x 4 inch tires
Cantilever rear springs
Auto-Lite starting and lighting
Vacuum tank fuel feed
Gasoline tank in rear with gauge
Electric control switches on steering column

The gasoline tank placed in the rear is another improvement. The vacuum system insuring a steady, even gasoline flow at all times is still another improvement.

The famous and complete Auto-Lite electric starting and lighting equipment is furnished.

All electric switches are on the steering column—right within reach.

The artistically designed streamline body with one piece cowl makes this car one of America's most attractive models.

Yet the price of this, our greatest four cylinder value, is less than any car of its size ever sold for before.

* * *

But go to the nearest Overland dealer and see this new model. Go over it—note all the very real and important improvements.

The Overland dealer is ready to make demonstrations now.

The Willys-Overland Company, Toledo, Ohio
"Made in U. S. A."

AUTOMOBILE JOURNAL



Working the Farm By Gasoline Tractor.

SINCE the advent of the automobile, which came a dozen or more years ago, there has been no mechanical invention put upon the market that means as much to civilization as the farm tractor, and particularly to that great class of people known collectively as the agricultural population.

It would almost be impossible to trace out the beneficial effects upon all of mankind that will accrue through the general use of this latest labor saving device. For the farmer it means more work accomplished on his farm at an expenditure of less money and labor on his own part and, if properly handled, will also be instrumental in relieving the farmer's family of those many arduous and monotonous tasks that are largely responsible for "the call of the city." To make the reader understand more clearly how the tractor is going to work out the farmer's salvation and make for peace, happiness and plenty in his home, a brief description of the machine and its functions is necessary to their enlightenment.

General Description of a Farm Tractor.

The tractor is a relative of the automobile, inasmuch as it runs on three or four wheels and is propelled by a gasoline motor. In appearance it resembles a varied line of self-propelled vehicles, from a high-powered racing car to a steam roller, the size being in proportion to the nature and amount of work it is designed to perform. The majority have extra heavy large rear wheels to secure perfect traction, as the machines have great tractive resistance to overcome. For this reason a number of the designs are equipped with what is known as caterpillar tread.

These machines to the uninitiated have a very queer appearance. The large wheels on the big German siege guns

that were so widely written about at the beginning of the war, give a fairly good idea of the caterpillar method of traction. But on the farm tractors, instead of these individual treads being hung on circular wheels, they are fastened together as a series of links and pass over the forward and rear wheels, giving a constant traction that otherwise could not be obtained unless enormously large and unwieldy driving wheels were employed.

The Passing of Farm Horses.

The "passing of dobbin" has been a frequently heard slogan with the coming of the automobile, but in passing he moved slowly from the farms. With the tractor coming into general use, however, the horse is being crowded out of his last "stamping ground" and the enthusiasm with which his successor has been greeted foreshadows an early extinction, at least in the service of heavy work on the farm. A series of tractor demonstrations are now being held in the middle west by the manufacturers of tractors. The machines are put to all the different kinds of work in preparing the seed bed to harvesting the crops and other services for which they are adapted.

Only those who have held a plough over several acres of virgin ground can appreciate the value of the tractor to the farmer, and this appreciation becomes keen with the knowledge that these tractors plough from two to 14 furrows at a time. The smaller machines are designed to pull from two to five shares, while the large ones pull from eight to 14. In this saving of time the work on the farm is accelerated all through the season and the farmer has less fear of weather conditions and labor shortage, which were formerly constant sources of worry.



Seeding 60 Acres in 10 Hours With a Tractor at an Actual Cost of Six Cents Per Acre for Power.



John Stark of Aurora, Ill., Disking His Fields Twice at One Operation with a Titan 10-20 Tractor.

A certain amount of ground is not only worked up in less time than formerly, but where occasion requires overtime labors, the tractor does not come in for any sympathy, or is it subject to the many ills of horseflesh. For this reason the farmer finds that he can lay out more ground and produce greater crops than he could when depending on his horses. When the harvest is over he can look forward to a long winter's holiday, figuratively speaking, as the wood shed, corn sheller, ensilage cutter, butter churn, bone grinding and other mechanical accoutrements about the place, which formerly necessitated much manual labor, can be operated by the tractor motor, the majority being equipped with pulleys that are specially designed for use in stationary purposes. For these purposes the tractor motor has many advantages over a stationary gasoline engine, as it can be readily moved about by its own power to locations convenient for operating the various machinery about the place.

While it would be mere guess work to make an arbitrary



Mogul 3-16 Kerosene Tractor Plowing Deep in Hard Adobe Soil on the L. H. Moise Ranch, Near San Jose, Cal.

statement as to how many horses one tractor would displace, actual practise shows that a medium sized machine in one line of work is cheaper and more efficient than four horses. The actual working power of one horse is hard to determine, as those animals not only vary in size and strength, but their working power varies and is limited to certain periods of time. They must have rest, be fed and watered regularly three times a day, have to be harnessed and unharnessed and at night should have clean and well bedded stalls.

All this care requires time, and, when used on heavy work, such as ploughing, the horse cannot be employed economically over eight hours a day. The tractor, on the other hand,

needs comparatively little care. Gasoline can be poured in the tank and the lubricating system replenished in a few minutes, and it is ready to go to work and remain on the job for nearly two years without stopping once for rest, barring possibly stops for minor repairs or the replacement of some worn parts. This is an impractical comparison, as no occasion would arise requiring that length of continuous service, but it illustrates the comparative weakness and inefficiency of the horse.

The construction of the tractor is rugged and simple and does not require any of the expert knowledge employed in keeping a motor car in good running order. Pneumatic tires, differentials and springs, which are frequently a source of trouble in the automobile, are eliminated. It is not a ma-



Modern Farm Power Crowding Hard Upon the Historic at a Demonstration of Farm Tractors.

chine that was suddenly called into existence through the discovery of the application of the gasoline motor to farm work, but represents the careful thought and work of designers who have devoted the past 10 years to its development and adaptation to service in agricultural pursuits.

No Expense Spared in Development.

There has been no expense spared in its production. It is a product worthy of the attention of men who hope to build up a large industry, as is testified to by the energetic and thorough methods adopted by these manufacturers in introducing it to the farmer in the demonstrations recently held at Dallas, Tex.; Hutchinson, Kan.; St. Louis, Mo.; Fremont, Neb., and those to be held at Cedar Rapids, Ia.; Bloomington, Ill.; Indianapolis, Ind., and Madison, Wis.

Man Eats While Tractors Fast.

At lunch time, or at night, the tractor may be left in its tracks without further

thought of its welfare until work is resumed. It can be used after supper if the illumination of the moon is sufficient to warrant night work and the farmer wants to make up lost time or gain time. With horse drawn machines operations on this plan would be impossible unless additional horses were kept, which involves additional expense for their keep while they are not producing. In the tractor the up-keep or maintenance cost when not in use is negligible.

One tractor manufacturer advertises that his 60 horsepower machine is equal to 25 horses, and another that his 35 horsepower machine is the equal of 16 horses. Other machines might be said to give an equal equivalent of working power in proportion to their horsepower.

It is plain that the value of the tractor has been established, and that the farmer has been emancipated in many respects from much of the distasteful labor that has so long cast a stigma upon his social qualifications. The use of the tractor should ameliorate and relieve these conditions and open a path for the farmer and his family to attain the same accomplishments and culture as his city cousins, affording him time for study and the participation in community gatherings where the frequent association with others not only proves educational, but gives him an ease of manner necessary to the thorough enjoyment of life. It should also lift



The Light Farm Tractor Builds Better Roads and Can Build More of Them Than Can Be Built with Horses—E. W. Martin, Ann Arbor, Mich., Owns This Outfit.



Tracklayer Tractor Hauling a Disc Plow in California, Showing the Dynamometer in the Coupling.

him from the category of the laboring class into a managerial position, as he can so extend his scope of activities over such a large field that all his time is required in directing the work. This suggestion might seem far fetched, but it is not, as actual demonstrations with the tractors show that they mean quicker, economical and more intensified productivity, besides making it more profitable. A better grade of products also results, as the work necessary to this end, which is often neglected, is carried out when it can be done by mechanical means instead of the slow drudgery of manual labor. Another significant fact about the tractor in this relation is that it is a substitute for the horse, which figures in for half the gross cost of farming in the United States.

There is an enormous market for the tractor among the 6,000,000 farmers in the United States, to say nothing of the possibilities in foreign markets. With the farmers growing over \$10,000,000,000



A Titan Tractor Road Grading Outfit Owned and Operated by the Town of Fairland, Oklahoma.

worth of product annually, they constitute a market which naturally attracted a large number of manufacturers to the tractor field as soon as they realized that the mechanical substitute for the horse meant to the agriculturist what the cotton gin did to the cotton grower. There are already nearly 150 different tractor manufacturers, with a promise of a great many more in the near future, as the older concerns are increasing their productive capacities and many are exporting on a large scale.

The first tractors that were produced were very large machines and have been in use on the great farms in the far West, but the big market for the machines is among the smaller farmers who operate on farms from 100 acres in size upward. The type in use by these farmers is called the light tractor and with two bottoms, or plough shares, will plough 5.6 acres in a 10-hour day at a cost of \$3.75 for fuel oil and lubricants, while four horses in the same time, at a cost of \$5, according to government figures, will plough but four



C. L. Shipman of Hughesville, Penn., Delivers Mogul Kerosene Tractors to His Trade Two Car Loads at a Time.



As An Example of the Interest Shown in Tractors is This Throng of More Than 30,000 People at a Demonstration Held Near Champaign, Ill.

acres a day. This comparison is made under working conditions. Stop the tractor and the expense ceases, but the four horses continue to run up an expense of about \$5 a day whether working or not.

The value of the tractor has appealed so strongly to the European farmer and authorities who are in charge of the rehabilitation of the country's resources, that it is a question of supply not demand. There is a strong feeling in the British automobile industry against the heavy importation of American trucks and pleasure cars during the war, but the American tractor is receiving a welcome, as even the competitive manufacturers there realize that it is a necessary adjunct to agricultural pursuits in the islands if the farmers are expected to increase the productiveness of the soil.

Foreign Governments Encourage Use of Tractors.

The fact that farming in the British Isles is on a comparatively small scale, and conducted after the intensified plan used by American garden truck producers, injects a peculiar phase into the situation, as in this country the tractor is looked upon as a proposition to be utilized by the farmer with 100 acres or more. The British farm averages much less than that number of acres, but the British authorities have made experiments and adopted a plan through which the small farm owner can be served by the tractor with equally beneficial results as he who operates on a large scale. The aid of the co-operative idea has been invoked and a number of farmers in a community buy shares in an organization which acts as the purchaser of the machine, which is let out at a suitable rental to pay for its cost and interest on the investment. In this way even the smallest farmer is enabled to secure the use of a machine to do the heavy work on his place and accomplish it in quicker time and better results than with horses.



The Utility and Power of Agricultural Tractors is Well Demonstrated in This View.

Throughout Europe, in fact, the cry for the tractor is heard above all the turmoil of the war and the government authorities in England, France, Germany and Russia, despite the undue strain and immense amount of work piled upon their executive organizations, have found time to experiment with the tractor in order to aid the farmer in increasing the much needed food supplies. Several American manufacturers have already risen to the opportunity afforded by this condition and have agents working in those countries, preparatory to establishing tractor plants.

The English idea of an agricultural tractor differs in many respects from that held by the American farmer, who ponders considerably upon the price before concluding a purchase.

The English home market necessarily requires the lighter type of tractor, but it is insistent that it should be well built with strong and simple mechanism that is properly housed to prevent injury from the rain and dust; also that if any devices are used on the wheels for securing traction that they be easily and quickly detached.

The Academy of Agriculture of France recently held a test of the latest types of tractors and compared the work done with that performed by horses and found in favor of the former. In one of these tests two and one-half acres were ploughed in four hours, with 10 gallons of gasoline. Similar tests with like results are being held in other countries and, excepting where unusual conditions obtain, there is every indication that the tractor is coming into universal use.

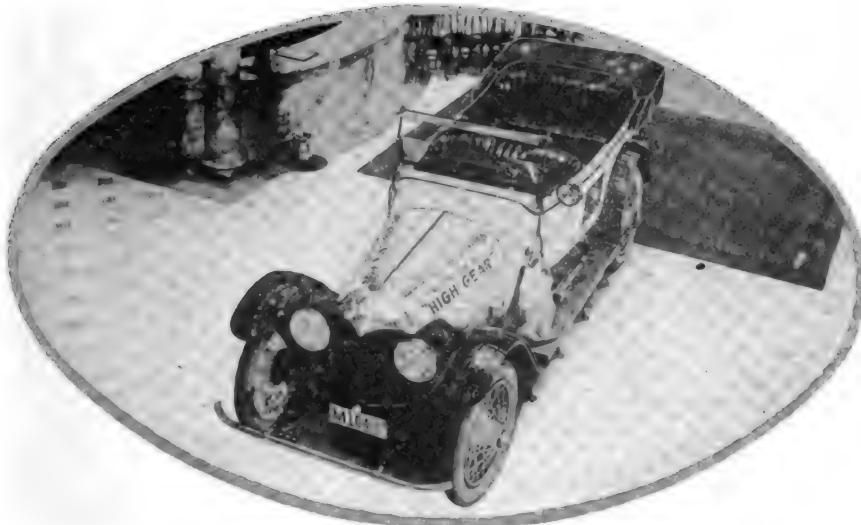
With the upbuilding of the tractor industry the question of distribution becomes one of the big factors. It is not an article that can be readily sold by catalogue or on the mail order principle, although thousands have been sold by the manufacturers as a result of their advertising. The distribution must be handled by dealers or agents on the same general lines as the automobile.

In the West and Southwest a number of dealers have already taken tractor agencies and are doing a big business, but in the eastern countries, where there also exists a large market for the lighter machines, there has been little interest shown in this branch of the business. All the states, however, between the Mississippi river and the Atlantic ocean contain thousands of farms which need tractors, and also many towns which will sooner or later buy these machines for use in road work.

The tractor in the road service is being rapidly developed and does excellent work in grading, scraping, removing stones, stumps and other heavy work that would require a large number of horses. Demonstrations are usually necessary in making a sale, but it does not always require that the dealer keep a machine in stock for this purpose, as he can take a prospective customer to any farm where one of the machines is being used and show it in operation and also give him the opportunity of getting the opinion of its owner.

Pathfinder Crosses Country In High Gear.

Twin Six Makes Remarkable Demonstration
and Ends Test at 60 Miles Per Hour.



Pathfinder High Gear Car in Lobby of Hotel, Sacramento, Cal.



Pauline Farmer Breaking Bottle of Champagne Over Pathfinder Car at San Diego.



Pathfinder Car Leaving San Diego Exposition Grounds.

WITH all gears but high and reverse removed, a Pathfinder stock twin six successfully made the transcontinental trip from San Diego, Cal., to New York City, arriving there Aug. 1 and establishing a record for high gear ability. Not content with this record the car was sent around the course at the Sheepshead Bay speedway at an average rate of 60 miles per hour in high gear while carrying two passengers and the transcontinental equipment.

High speed averages were not attempted during the run. The car was started on July 3 and made a daily average of about 200 miles a day for the 4889 miles of the trip. No night driving was indulged in and four days were lost en route through the drivers idling for rest

and making special demonstrations.

The car was sent over the Lincoln highway and had been officially sealed by the A. A. A. representatives, and was also examined by the association at several times during the trip and at the conclusion. The car was checked in and out of every community of consequence by local boards of trade, hotel keepers and other interested persons.

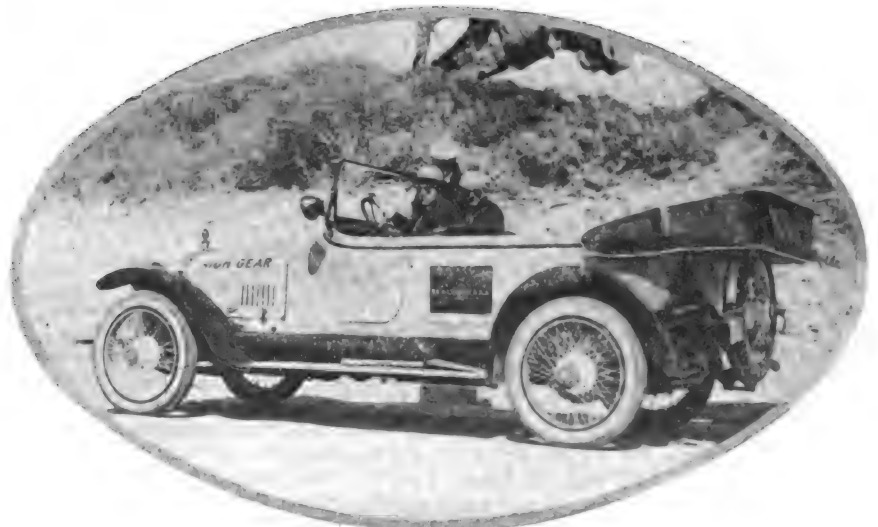
Walter A. Weidely, son of the designer of the car, George Weidely, piloted the car practically the whole distance. He reports the most trouble in negotiating Lucky Boy mountain, Nevada, when he was forced to exert strenuous efforts to get through on high gear.

The average gasoline consumption was 10.2 gallons to the mile. There was a driver, mechanic, a variety of spare parts for emergencies, including extra live axles and a clutch (which were not

required). The left side tires, front and rear, came through with California air in them, while the right side ones had to be changed on the road.

The car demonstrated remarkable cooling qualities. Notwithstanding that grades to the extent of 24 per cent. were encountered and made on high, the radiator boiled only once and only 34 gallons of water were used. For five days Mr. Weidely drove the machine over the Great Salt Lake desert while the thermometer registered about 100 degrees every day, and during this time he negotiated eight miles of heavy sand, which frequently was as high as the wheel hubs. Throughout the journey, particularly in the West, the Pathfinder car was given the severest of tests for high gearability.

The car was a stock model, as was attested to by the A. A. A. representative after inspection at the start, and was geared five to one on high, which is the standard ratio supplied on Pathfinder cars intended for hilly regions.



Pathfinder Twin Six on Torrey Pines Grade, Cal.

A TRIP THROUGH the PINE FORESTS of MAINE

MAINE is the ideal touring ground, affording a variety of scenery such as is found in no other section of America. Leaving the coast at Bar Harbor the tourist strikes into the hills and mountains, their sides wooded with the most beautiful pine forests in existence. The roads pass along the shores of shimmering lakes where the fishing is excellent and ideal spots are found for camping overnight.

The Starting Point.

Starting from Boston the tour, shown in the accompanying map, leads northward through Newburyport to Portsmouth, N. H., a pleasant morning's drive. In the itinerary given herewith the route from Boston to Newburyport goes through Cambridge, Everett, Lynnfield and Topsfield, but this leg of the trip can also be made over a route through Lynn, Salem and Ipswich, while beyond Newburyport there is only one main highway to Portland.

Portsmouth is well known as the home of Thomas Bailey Aldrich and also in historic interest as the launching port of the "Ranger," the famous privateer commanded by John Paul Jones. Across the river is the Portsmouth Navy Yard where the Russian and Japanese envoys met to settle the war in which they were engaged over 10 years ago.

From Portsmouth to Portland the highway is in excellent condition, the major portion of it having been complet-



A Woodland Vista.

ed this year and is of bituminous macadam and concrete. Almost every town that is passed through between these two cities has interesting features and boasts of residents who are internationally famous as authors. York and Kennebunkport are the summer homes of William Dean Howells, John Kendrick Bangs, Thomas Nelson Page, Peter Finley Dunne, Booth Tarkington and George Barr McCutcheon.

Old Orchard, which is reached by a

short detour off the main highway, is one of the country's most famous resorts and is particularly noted for its bathing beach. This beach is 400 feet wide for a distance of 10 miles and was used as an automobile race course a number of years ago.

The First Night Stop.

Portland, which is the first night stop, has a number of very good hotels. A whole day can be profitably spent in going from Portland to Rockland, although the distance is less than 81 miles, the district through which the tourist travels is one of the most interesting in New England both from a scenic as well as a historical point of view. A beautiful boulevard, 26 miles long, takes the tourist to the first stopping point, Bath, which is a famous ship-building centre and where many of the nation's fighting ships were constructed. The first English settlement in New England was established just below the city, at the mouth of the Kennebec River, in 1607.

Leaving Rockland, where the second night stop is made, the road to Bangor lays close to the shore of Penobscot Bay and for over 36 miles runs through one of the most beautiful sections of the state. This drive has been pronounced by many of the tourists, one of the finest on the Atlantic coast.

Along the Penobscott.

At Stockton Springs the road turns northward, striking the Penobscott

River at Frankfort and follows the bank of the river into Bangor.

The trip from Bangor to Bar Harbor should prove the most delightful of the tour, as it passes through country which is typical of Maine's beautiful scenery, the road winding through hills and past scenic lakes to Mt. Desert Island, which is reached over a toll bridge. This island, on which Bar Harbor is located, is about 100 square miles in area. It has been compared by many artists with the most wonderful scenic spots of the world. There are many fascinating drives about the island.

Returning from Bar Harbor the road leads back through Toll Bridge, the only point of entry to Ellsworth, where a turn to the south is made through Surry and Orland to Bucksport. The road then runs northward back to Bangor along the east bank of the Penobscott River. Bucksport, as well as several of the small towns passed through on this short leg, are widely known as the birth places of leading actors and actresses.

On the sixth day, riding from Bangor to Augusta, the route goes into the interior of Maine where long stretches of road are encountered, passing among pine forests, hills and valleys for a distance of 50 miles. The remaining 25



Picturesque Scenes Like This Abound in Maine.

miles of this leg of the tour, which extends from Benton to Augusta, lays along the east bank of the Kennebec River

Maine's Capital City.

The country through which the tourist passes on the seventh day is extremely interesting. A few miles out of Augusta the northern end of Cobbosseecontee Lake is passed and the road enters the famous apple belt of Maine.

The Objective Point.

Poland Springs, the objective point of the seventh day's run, is one of the best known places in New England and is known throughout the world. An interesting point on this run is the large

coast is the rocky shore formation so much in evidence as it is throughout this section. The coast line is also very irregular, being broken up by thousands of small bays and inlets with as many or more islands laying off shore.

Being in the most northerly section of the United States, locations on these pretty spots were naturally selected as summering places by many wealthy people who, attracted by the beautiful scenery and ocean breezes, tour into this country by the thousands every year. It is an exceptionally pleasant trip, too, as the roads leading up through Maine are in very good condition.

Shaker colony at Sabbath Day lake.

From Portland back the route may be followed in reverse direction from that given at the start of the itinerary as far as Newburyport, where three different roads may be taken to Boston. The tour covers a mileage of 578.4 and makes a convenient week's trip.

"The Rockbound Coast of Maine," is an expression frequently heard when reference is made to that section of the Atlantic seaboard, extending northward from Cape Ann to New Brunswick and it is truly descriptive, as nowhere else along our sea-

Boston to Portsmouth.		
Boston	0.0	Topsfield 24.5
Cambridge	2.5	Newburyport 37.3
Everett	7.2	Hampton 48.4
Lynnfield	15.6	Portsmouth 59.3

Portsmouth to Portland.		
Portsmouth	0.0	Wells 24.4
Kittery	1.0	Kennebunk 29.5
York Corner	7.6	Biddeford 38.2
York Beach	13.1	Saco 39.1
Cape Neddick	14.9	Scarboro 44.8
Ogunquit	19.0	Cash Cor. 51.2
Moody	21.0	Portland 54.0

Portland to Rockland.		
Portland	0.0	Newcastle 54.0
Falmouth	6.1	Nobleboro 58.7
Yarmouth	11.7	Glendon 61.2
Freeport	17.4	Waldoboro 64.8
Brunswick	26.3	West Warren 71.3

Bath	35.5	S. Warren 74.6
Wiscasset	45.0	Thomaston 76.6
N. Edgecomb	46.5	Rockland 80.9

Rockland to Bangor.		
Rockland	0.0	Stockton 36.9
Rockport	6.3	Prospect 41.4
Camden	7.9	Frankport 45.5
Northport	18.9	Winterport 48.5
Belfast	26.7	Hampden 55.6
Searesport	32.7	Bangor 61.7

Bangor to Bar Harbor.		
Bangor	0.0	Toll Bridge 35.7
East Holden	8.9	Bar Harbor 46.5
Ellsworth	26.6	

Bar Harbor to Bangor.		
Bar Harbor	0.0	Orland 42.2
Toll House	10.9	Bucksport 44.7
Ellsworth	20.0	Orrington 57.2
East Surry	24.0	S. Brewer 60.8

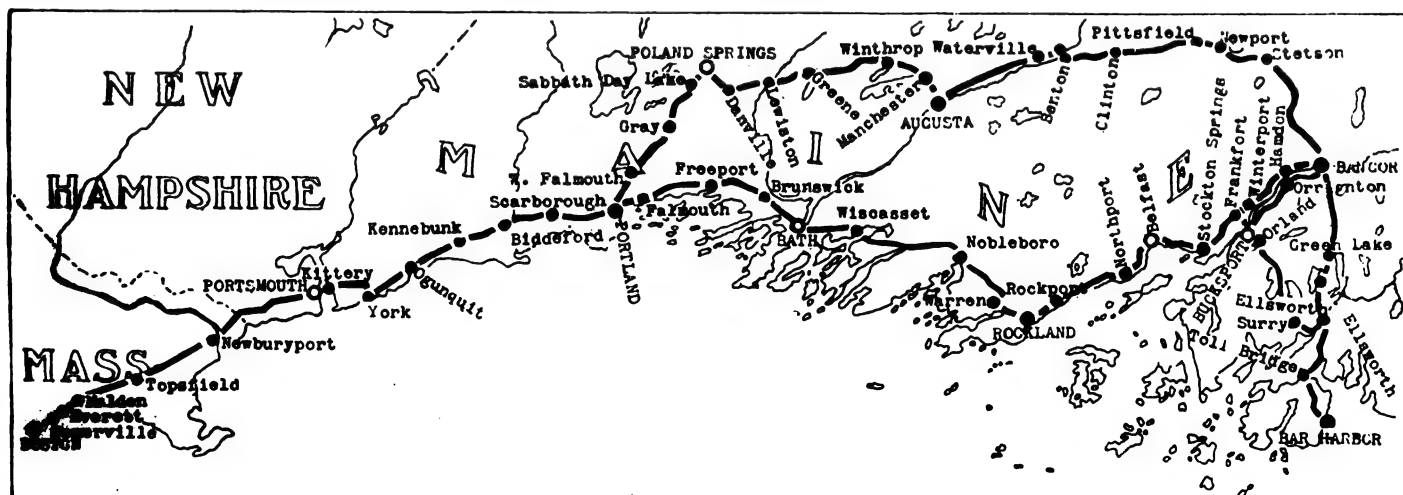
Surry	26.3	Brewer 63.9
E. Orland	38.4	Bangor 63.7

Bangor to Augusta.		
Bangor	0.0	Pittsfield 33.7
Hermion	7.4	Clinton 46.3
Carmel	14.6	Benton 50.5
Etna	17.7	Waterville 54.1
Newport	26.4	Augusta 75.4

Augusta to Poland Springs.		
Augusta	0.0	Lewiston 31.0
Manchester	4.5	Auburn 31.4
Winthrop	10.5	Danville 37.3
Greene	22.9	Poland Spgs. 43.6

Poland Springs to Portland.		
Poland Spgs.	0.0	W. Falmouth 20.4
Dry Mills	7.8	N. Deering 25.8
Gray	10.5	Portland 27.5

Portland to Boston.		
Reverse first two legs of tour.		



Route Map of the Trip from Boston to Points in Southern Maine.

MARMON MAKES COAST RECORD.

Driven Across Country by Millionaire In But Little More Than Five Days

From coast to coast in five days, 18 hours and 30 minutes is the latest cross country record and was made by a Marmon 34, driven by S. B. Stevens, a millionaire automobile enthusiast, who is chairman of the Motor Reserve Division of the American Defense Society.

(Stevens, who made the trip under the auspices of the society, drove half of the distance himself from New York City to San Francisco, 3476 miles. The officials of the Automobile Club of America

to South Bend, Ind., and on to the Lincoln highway, which was followed to the coast with the exception of a few minor detours. The car used was a regular Marmon 34 stock touring car, with tonneau removed and auxiliary gas tank.

CHARGE BIDWELL WITH FRAUD.

The Postoffice Department has issued a fraud order against the International Automobile League, Inc., the International Automobile League Tire Company of Buffalo, N. Y., and A. C. Bidwell, president of both concerns. The investigation was conducted at the request of the Associated Advertising Club of the World.

The records made through the investigation are said to show that Bidwell was indicted by a federal grand jury at Rochester, N. Y., for using the mails to defraud and that he and two of his agents were indicted by the federal grand jury of Fayette county, Pennsylvania, on a charge of conspiracy to defraud.

It is claimed that through the operation of these organizations the promoters realized a fortune from the

to throw even a better light than the old type when on full power and can be dimmed for driving in the cities.

SCRIPPS-BOOTH'S OFFER.

In addition to the two standard finishes, blue-black with white trimmings and Scripps-Booth gray, the Scripps-Booth company this year will turn out a number of machines in other colors, at a slightly additional charge.

The regular colors are maintained on the majority of the cars, but each month a few will be finished in a different color, enabling the purchaser to order a car finished with a distinctive appearance. In June the special color was azure blue and in July maroon. Color plans for several months in advance are announced so that purchasers can place their orders according to their desires.

BAY STATE TRAFFIC.

The traffic in Massachusetts is rapidly becoming motorized. During 1915 motor vehicles constituted 82½ per cent. of the total traffic, as against 39 per cent. in 1909. In those six years motor vehicle traffic has increased 70 per cent. each year, while horse drawn traffic has increased but five per cent. annually.

When the first traffic census was taken in Massachusetts in 1909 the figures were gathered from 238 points on the 1100 miles of highways in the state. The census takers made their count 14 hours a day for a full week.

The 1912 census, taken under similar conditions, showed that there were 63 per cent. motor vehicles and 37 per cent. horse drawn vehicles. The total traffic carried by the roads during the six-year period increased 145 per cent. Motor vehicles increased 420 per cent. and horse drawn vehicles decreased 30 per cent.

"TWO YEARS IN TWO WEEKS."

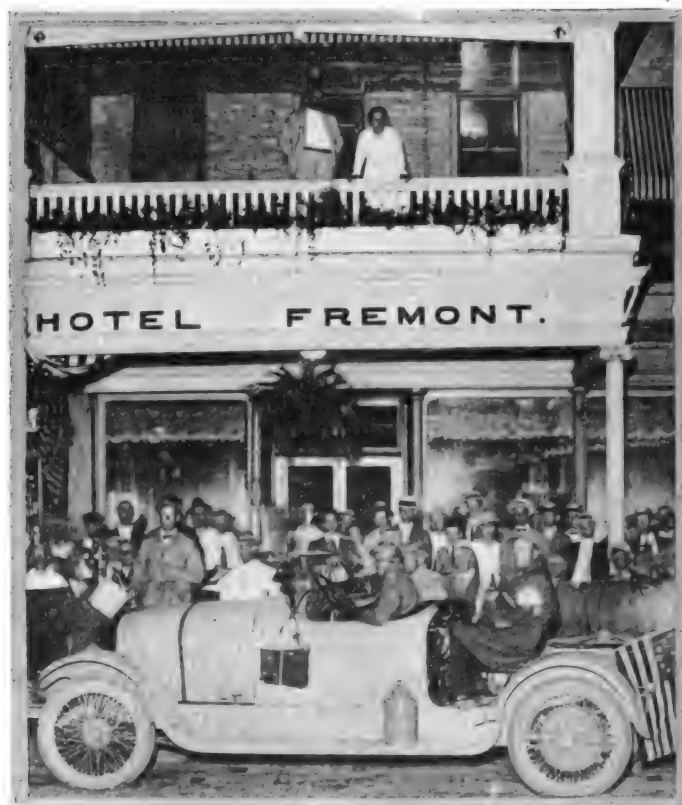
The King Motor Car Company has issued a booklet entitled "Two Years in Two Weeks," which gives an account of the 10,850-mile non-motor stop run made by a stock eight-cylinder King in the Car Owner's Service Test.

President Artemas Ward, Jr., of the King Motor Car Company, is also having the official report of the run tabulated, which will be sent to applicants upon request to the King Motor Car Company at Detroit, Mich.

LARGE STUDEBAKER PROFITS.

The profits of the Studebaker corporation for the six months ending June 30 were \$6,028,329, which amount includes \$180,000 of war order profits. After allowing seven per cent. dividend for the old stock the amount remaining is equal to 18.80 per cent. on the common stock.

The corporation's business is at present 50 per cent. greater in volume than at any time during its history.



The Transcontinental Marmon Pulling Up at Fremont, O.,
About a Fourth of the Way on Its Journey.

checked the car out at New York and in at San Francisco.

The trip was made not alone to establish a record, but also to determine the reliability of the motor car in being pushed to its utmost speed over all kinds of roads and in all kinds of weather conditions. In this respect the test was an excellent one, as in the far western country the recent rains had placed the poor mountain and desert roads in very bad condition. An average speed of better than 32 miles an hour was maintained for more than 2100 miles from New York to Cheyenne, Wyo., including stops.

None of the regular cross country routes were followed throughout. The first part of the trip being made over the New York state road system through Albany, Syracuse, Buffalo, Erie, Cleveland,

automobile users.

REFLECTORS ON PIERCE ARROWS.

The Pierce Arrow Motor Car Company has adopted "Sutterly" offset reflectors as part of the regular equipment on its new cars. With the use of these reflectors at night a man may be seen distinctly, with the exception of his head, at a distance of 400 feet, and the light cannot shine in the eyes of another motorist facing it unless he lowers his eyes to a level approximately 3½ feet from the road.

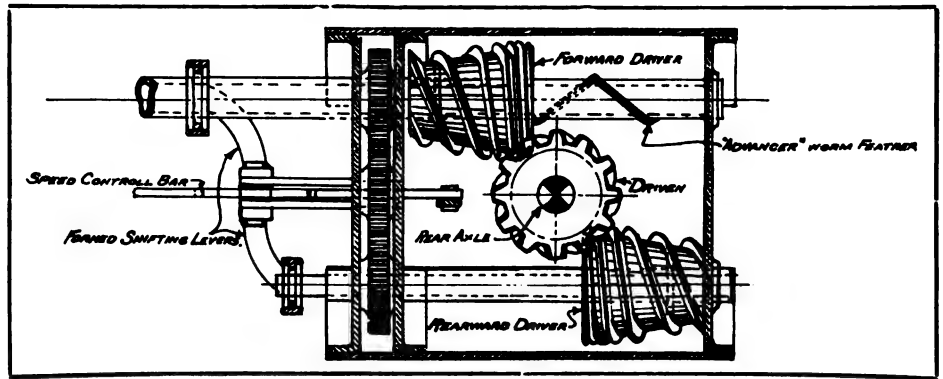
The control of the beams of light is effected through the use of different focal lengths in the upper and lower half of the reflector, although they are both true parabolic sections. They are said

Variable Speed Transmission.

A Distinctly New Idea In Speed Changing Mechanism.

A DISTINCTLY new idea in speed changing mechanism, on which patent was allowed May 31, 1916, is being developed by the Church Engineering Company of Philadelphia, Penn., the most interesting feature of which is the combination, in one pair of gears, of the double functions of terminal drive and change of ratio.

While comparable in their action to the conventional worm and worm wheel drive, the driving and driven members might more properly be considered as



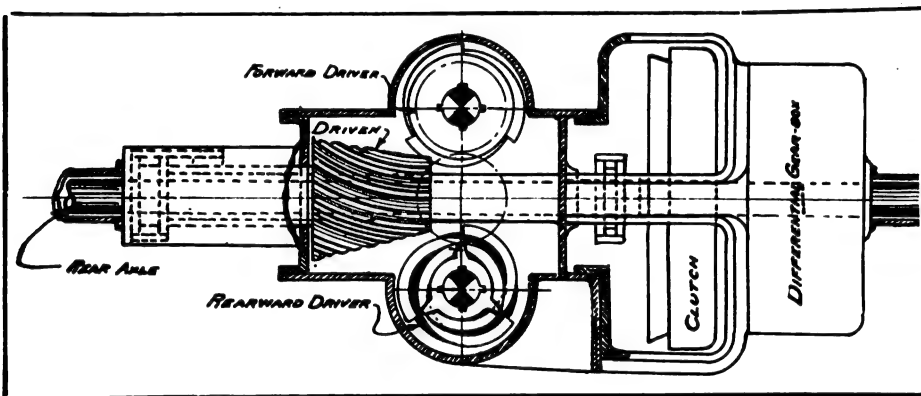
Side Sectional Elevation of Variable Speed Transmission.

gear can be meshed at a time. Both driving gears have sufficient travel on their respective shafts to permit of their being moved free of engagement with the driven gear when control is in "neutral" position. The key ways in both

for the transmission is that the speed of a vehicle can be decelerated without the use of brakes, simply by throttling down the engine. This is especially true on the lower speeds in which the relative tooth angles are such as to permit easy movement, or turning effort, in one direction, but resist any tendency of the driven shaft to turn the driving member.

A further claim of the patentees is a considerable reduction in weight and manufacturing cost due to the elimination of the gear set. There are several other novel features connected with the method of speed control, location of differential, etc., but these are of secondary importance as compared to the unique gear construction.

Having in mind the growing popularity and increasing adoption of the worm gear terminal drive, as well as recent developments in favor of a more elastic and more easily controlled "speed shift" (of which the so-called magnetic drive is a concrete example), it seems likely that progressive motorists, as well as engineers, will await with considerable interest the practical application of this transmission to some form of road vehicle.



Rear Sectional Elevation, Looking Forward.

spirally threaded cones, since the formulae which relate to worm gearing, affecting the pitch, shape of teeth, etc., do not apply to their construction.

Briefly considered, the cone shaped wheels have helical teeth, or threads, wrapped around their circumferences with a variable lead, or pitch angle, the variation in pitch being such that as different "zones" of the wheels are brought into contact a change in relative angular velocity is brought about.

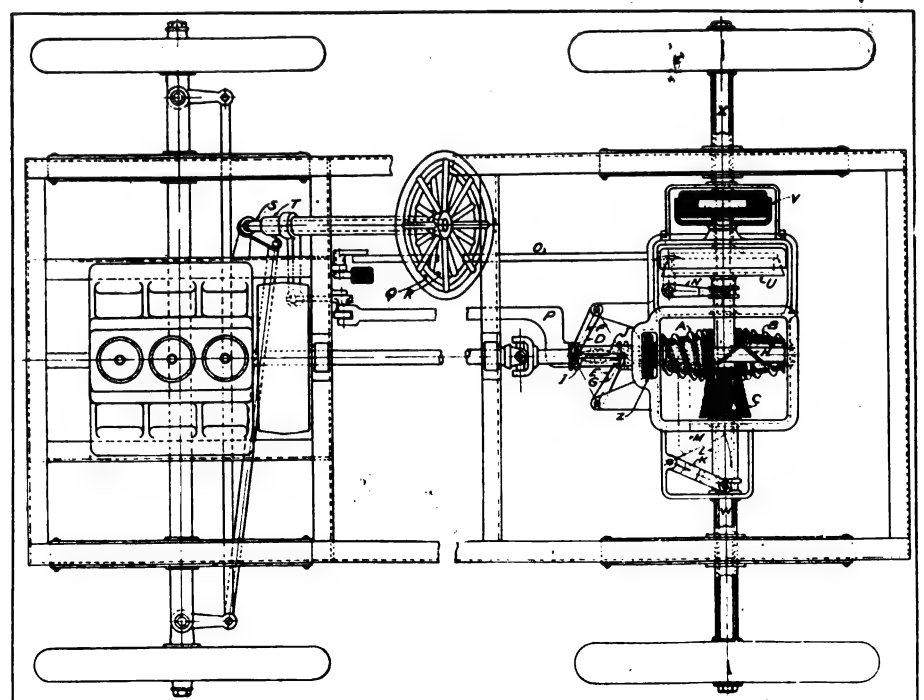
Changes in the position of the gears, resulting in change of speed, are made without taking the teeth out of mesh, also without disengaging the clutch, and in a manner which is described in the following.

It will be seen by reference to the cuts that two parallel shafts are mounted to straddle the driven shaft, their axis being transversely arranged with respect to the latter. One of these shafts is directly connected to the prime mover and the other is made to turn with it in the same direction by a train of spur or helical gears, which are constantly in mesh. Each shaft carries one of the specially cut driving gears, these being free to move longitudinally on the shafts, but restrained from angular movement by feathers, or keys, which engage splines in the shafts.

The driving gears are used alternately, one being for forward movement and the other for reverse, the controlling mechanism being so connected that only one

driving shafts are cut spirally, so that the gears "roll" into mesh, much in the same manner in which the thread of a nut engages a bolt.

In addition to the elimination of "clashing" gears, one of the claims made



Plan View of the Variable Speed Transmission.

PLAN AUTO COMFORT STATIONS.

Organized Movement for the Better Convenience of Motorists Started.

An organized movement has been started under the name of "The American Plan," to establish comfort stations for automobilists in cities along all highways with the object of affording tourists and other automobilists the same comforts that the travelers in railroad trains have provided for them by the railroad companies.

The movement, which has been started by the Public Comfort Station Bureau, 261 Broadway, N. Y., has the approval and support of the American Automobile Association, National Old Trails Road Association and other national motoring organizations. As the value of these stations have been recognized by the War Department for war purposes, Major Carl F. Hartmann has been detailed to co-operate in the work with the organizers.

It is proposed to have the cities build these comfort stations at desirable points along the highways at a cost of approximately \$10,000 each, and to charge for the various privileges a sufficient sum to pay maintenance costs, interest on the expenditure and enough money into the sinking fund to return the cost of the building in 10 years. The smaller cities could build less expensive structures. Through this plan the automobilist would be afforded many comforts and would not have to call so frequently upon the hospitality of private

residents along the highways.

Besides providing toilet accommodations for the motorists, they can be used as emergency hospital stations in case of war or accidents in time of peace. By connecting the different stations with telephones they will prove invaluable in checking crime and as headquarters for scout and defense duty in war times.

There is more travel at the present time by motor than there is by the railroads, a fact which makes the need of these comfort stations almost imperative. They would be provided with comfortable waiting rooms and sanitary toilets for men and ladies; have pure drinking water available, and in countries where the natural water is hard have small water softening apparatus for making the water suitable for radiator purposes.

Directories, charts, road maps and other facilities for guiding the motorist in his travels would be kept in the stations and an opportunity would be afforded to advertise the advantages of the various cities by pointing out the places of interest.

MOTOR TROUBLES.

Among the many causes advanced for the great majority of motor and transmission troubles, the continued use of inferior and unsuitable oils hold the

chief position. One of the latest authorities to advance the theory is the manufacturer of Emco automobile oils, the Emery Manufacturing Company, Bradford, Penn., which is so strongly of that belief that it refines its product from Bradford crude, the finest mineral oil produced, and backs this up with a guarantee that is unique among motorists. The company guarantees Emco automobile oils to lubricate properly the cylinders of cars for which they are recommended, and if they do not give satisfaction in every respect, the unused oil may be returned at the company's expense. The full amount paid will be refunded, as well as the freight and cartage both ways, and no charge is made for the oil used.

CELEBRATE DIXIE PROGRESS.

A good roads exposition and convention will be held at Music hall, in Cincinnati, from Oct. 23rd to the 26th inclusive, as a fitting observance of the first year of progress in the construction of the Dixie highway from Chicago to Miami, Fla. The exposition will be unique in many respects, consisting of an exhibition of modern equipment and materials used in road construction, motor trucks, touring cars, automobile accessories and equipment, semi-rural home comforts, the products and advantages of all important cities on the route of the Dixie highway and an exhibition of Cincinnati's home products.

President Wilson and the governors of a number of different states have been invited to address the meeting. Discussions of good roads problems will also be held and prominent good roads speakers are expected to participate.

ENOS M. CLOUGH DEAD.

Enos M. Clough, who built a horseless carriage over 50 years ago, was killed in Laconia, N. H., last week by an automobile. Mr. Clough was known as one of the first inventors in the United States to construct a motor car that was actually sold and used. The machine had wooden wheels and was propelled by a steam engine and the boiler was so arranged that all the attention necessary to keep it running could be given it by the driver without leaving his seat. The machine was sold to the late Richard Grove of Laconia, who ran it on the streets of that city for some time before dismantling it.

PRESENTS REGAL TO MILITIA.

James A. Knox, president of the Knox Auto Company of Oklahoma City, Okla., Regal distributor for that state and the southwest, has presented a 40 horsepower Regal chassis to Company M of the state militia. This car will be equipped with one of the machine guns recently presented to the state by the United States government, under the condition that they be mounted on motor cars. A subscription list had been started among the business men of Oklahoma City to procure these cars when Mr. Knox announced his gift.



CONVICT-BUILT ROAD IN COLORADO.

A Glimpse of the Titanic Task Accomplished by Colorado Convicts, Under the Honor System, at "Engineer's Lariat," on the Lookout Mountain Loop Trail—Photograph by Courtesy of the Touring Information Bureau of America, Kansas City.

Motoring Togs.



Turban of Black Satin with Odd Arrangement of Wide Grosgrain Ribbon. (Bonwit, Teller & Co., N. Y.)



Rose Glazed Kid Turban with White Satin Facing and Feather Band and Ornament. (B. Altman & Co., N. Y.)



A Bernard Sport Suit: White Serge Coat with Plaid Skirt, and Pockets and Collar Facing, Pipings of Same Goods. (J. M. Gidding & Co., N. Y.)

The Ecclesiastical Suit: Pontiff's Hat, Cardinal's Coat, Caped Wrap of Gray Mohair and Blue Cuffs and Collar. (Jas. A. Hearn's Sons, N. Y.)

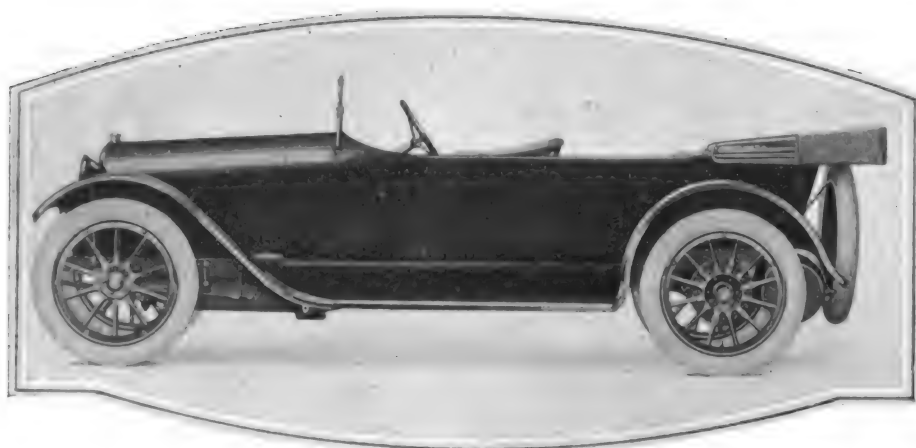
Rather Unusual in Its Simplicity Is this Coat of Natural Pongee. The Dip in the Back and the Patch Pockets Are Smart Features.



Attractive Motor Bonnet of Silk and Chiffon and Coat of Sand Colored Velour de Laine with Velvet Trimming Is a New Motoring Combination.

Photographs by Joel Feder, New York.





Elgin Five-Passenger Touring Car.

AMONG the new offerings in the field of light sixes the Elgin, with its distinctive and "classy" appearance, and well balanced and up to date chassis design, is decidedly worthy of attention. The car combines maximum value at a minimum cost and displays considerably more quality and refinement than are usually found in machines selling at or near its price.

Two models are offered, a five passenger touring car and a clover leaf roadster, both selling at \$845. Both have extremely attractive lines and, with their low hung effect, graceful stream lines and concealed fittings, coupled with a "V" shaped radiator, may be said to reflect the very latest tendencies in external design.

The seats are carried somewhat lower than is the average practice and, in the touring car, the sides of the body are brought correspondingly low, being several inches below the level of the hood and producing a top line which is distinctly pleasing to the eye. The roadster has the rear "turtle back" extension carried back further than is usual, with a resulting improvement in symmetry of outline.

The wheel base is 114 inches, with 32 inch by 3½ inch wheels, the rear pair being shod with non-skid tires.

The chassis presents a very clean cut appearance, a judicious selection of high grade components producing a harmoni-

ous ensemble which is well laid out in every detail and, like the bodies, quite up to date in all respects.

The motor, clutch and gearset are incorporated to form unit construction, the weight being supported in a large trunnion on the front cross member and bolted at the rear to two brackets riveted to the side rails of the frame, the power plant thus being relieved from any strains due to frame distortion. The engine is of exceptionally neat design, having cylinders cast en bloc, overhead valves, and bore and stroke of 3 and 4¼ inches respectively, developing 35 brake horsepower. The valves are actuated by rocker arms and vertical push rods extending down to the cam shaft in the crank case. A notable feature is the removable head, containing the complete valve assembly, this construction making valve grinding much easier and permitting easy access to the pistons and cylinder walls for carbon removal and similar operations.

A neat fitting housing serves to protect valve springs and rocker arms from dust and to secure quiet operation of these parts. The inlet manifold is formed in the head, but has two outlets, so that a two arm external manifold is used to attach the carburetor. The latter is a one-inch Rayfield, taking warm air through a flexible tube from a pre-heater on the exhaust manifold, which is an independent casting and connected

with the muffler through a large diameter steel tube free from sharp bends. No muffler cut out is provided. Thermo-syphon cooling is used, the V shaped cellular radiator being assisted by a belt driven fan, with tension adjustment.

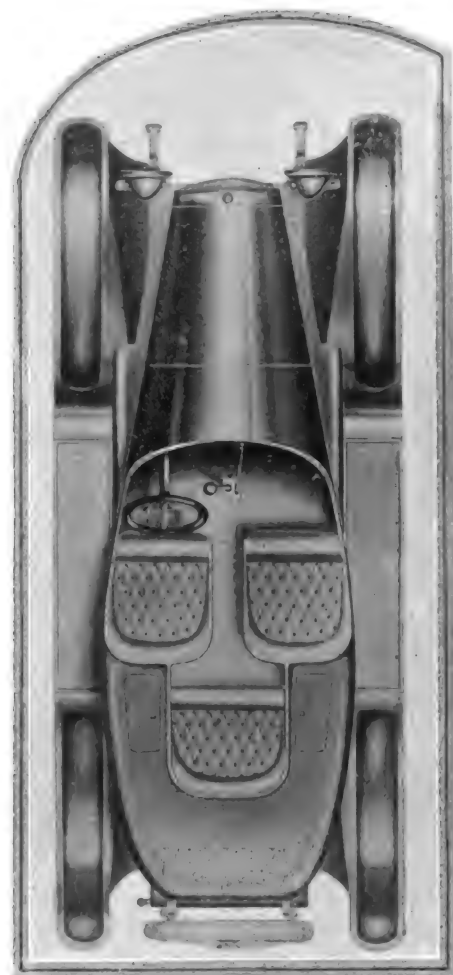
Gasoline is brought from the under-slung tank at the rear by means of the Stewart vacuum system. Oiling is accomplished by a reciprocating pump operated by cam shaft, the oil being

The Elgin Light

A Distinctive Chassis Design and Refinement Than is Gene and Weight--Motor Registers

delivered to the timing gear case, from which it flows into the crank case, where it is maintained at constant level by an overflow to the main reservoir, passing through a fine mesh strainer.

The helically cut cam shaft gear acts as an idler for a third gear which drives the generator shaft, on which is also mounted the vertical Delco ignition unit

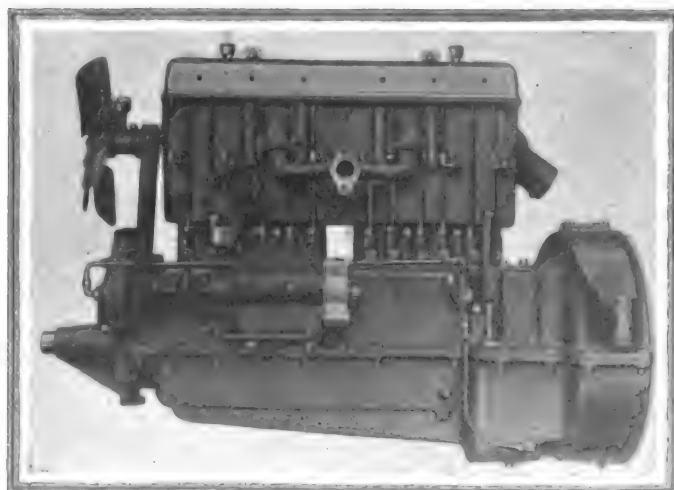


Interior of the Roadster.

by means of spiral gears. Cams are integrally formed on the drop forged cam shaft. Both this shaft and the crank shaft have three bearings, which are of robust dimensions in proportion to their diameters and the cylinder dimensions. The interior motor parts conform to general practice.

The starting and lighting installation consists of two Dyneto units, the motor being a fixture on the right side of the engine and having its pinion engage with the toothed fly wheel automatically by means of the Bendix inertia device.

The dry plate clutch, made up of alternate steel and Raybestos faced discs, is enclosed in a housing which also in-



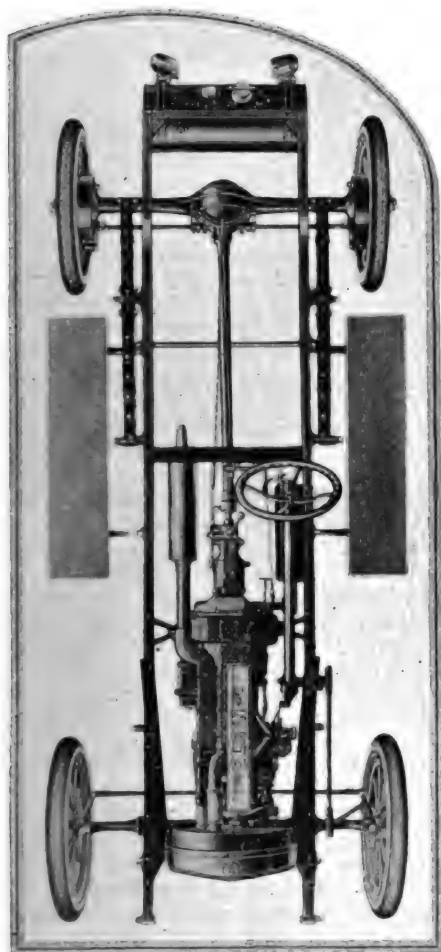
The 35 Horsepower Motor.

Six-Cylinder Car.

Displaying Much More Quality
rally Found In Cars of Its Price
35 Brake Horsepower.

cludes the gearset. The latter has three selective forward speeds and reverse, the gears and shafts being of special alloy steel mounted in annular ball bearings.

The propellor shaft is carried in a torque tube, supporting the latter near its forward end with a telescopic bearing, and connecting to the transmission



The Stripped Chassis.

shaft with a dust proof universal joint.

The rear axle is pressed steel, the two halves being autogenously welded together to form one piece, and two central removable plates being provided to form a rear inspection cover and differential carrier respectively. The front plate can be removed from the axle housing with the pinion shaft, torsion tube, and differential assembly, so that the mesh of the pinion and the master gear can be easily adjusted when they are thus exposed. The gear reduction is 4 to 1.

The three quarter floating live axles are so designed that the advantages of the full floating type are obtained without sacrificing the ability of the rigid

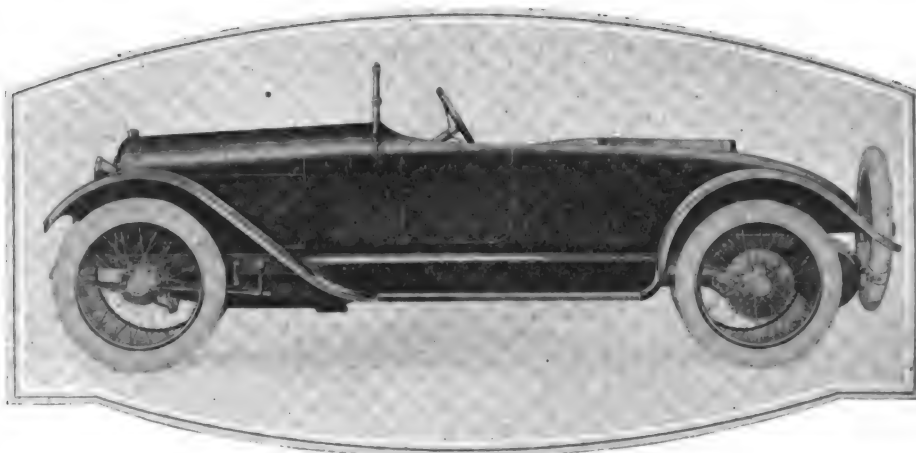
construction to resist side strains. The outside ends of the driving shafts terminate in integral flanges which bolt solidly to the hub flanges, the wheels being carried on the housing with double race ball bearings. This makes it possible to remove the shafts without taking off the wheels or jacking up the car, which is one of the principle advantages claimed for the full floating type of axle.

Service brakes are of the external contracting type and the hand brake shoes are internal expanding, both being provided with equalizing yokes just forward of the axle, and with means of easy adjustment.

The front axle is an H section drop forging, having integral spring pads and Elliot type knuckles. Front wheels are carried on adjustable ball bearings. Steering arms are connected by an adjustable tie rod to permit of correction if the wheels become out of alignment. The steering gear is of the worm and full worm wheel type, making it possible to mesh the worm wheel in four positions during the life of the car. Other means of compensating for wear are also provided. The drag link has automatic spring take up on both forward and rear ball and socket joints. Grease cups of substantial size are provided for all working joints.

The semi-elliptic front and cantilever rear springs are of the self-lubricating type, insuring easy spring action and overcoming the squeaking which comes from dry spring leaves. All spring bolts are hardened and ground and formed with integral grease cups. The forward driving effort is carried through the rear springs instead of through the torsion tube.

Artillery wood wheels are regular equipment, but wire wheels are optional at an extra cost of \$50, which includes an extra wheel and carrier.



Elgin Cloverleaf Roadster Model.

The pressed steel, heat treated frame has parallel side rails and is kicked up over rear axle, the gasoline tank being supported under the rear cross member. The crown fenders and running boards are substantially mounted and of generous dimensions.

Standard equipment includes one man top, with Jiffy curtains, Stewart vacuum feed, extra rim and carrier, electric horn, pump, tire kit, tools, etc.

It will be seen from the specifications that no effort has been spared to turn out an automobile which satisfies the preferences of the average buyer. Individuality has been attained without the adoption of untried novelties or tendency towards freakishness and, while distinctly modern in all respects, only such improvements have been incorporated as have been definitely approved by "the man in the street."

ADOPTS PERFECTION HEATERS.

The Shaw and Yellow taxicabs in Chicago are to be equipped with Perfection heaters, manufactured by the Perfection Spring Service Company of Cleveland, O. This is the second large order received by this company, one recently being placed by the Cole Motor Car Company, which will install them as standard equipment in the Cole-Springfield type models during the coming season.

Motor, Six-Cylinder, Valve-in-Head. Bore and Stroke, 3x4½ inches. Horsepower by brake test, 35. Carburetor, Rayfield, Vacuum Feed. Ignition, Delco, Automatic and Manual. Starting and Lighting, Two-Unit Dyneto. Clutch, Multiple Disc Dry Plate. Gearset, Three Speed Selective Type. Lubrication, Force Feed and Splash. Cooling, Thermo-Syphon, V Radiator. Wheelbase, 114 inches; Clearance 10. Tires, 32 by 3½, Non-Skid at Rear. Rear Axle, Three-Quarter Floating. Road Weight Complete, 2200 Pounds. Price of Roadster and Touring, \$845. Five Passenger Touring Model. Three Passenger Roadster Model. Wire Wheels Are Optional and Extra.

Technical Features of the Elgin Six.

Survey of the Pneumatic Tire and Rim Situation.

Discussion of the Development and Possibilities of Various Types of Demountable and Detachable Tire Rims.

By J. E. HALE.

Experimental Engineer, Goodyear Tire & Rubber Company.

By 1907 the detachable rim with a straight-side tire had become so much appreciated by the public that the clincher-tire manufacturers were obliged to furnish some sort of a detachable tire. The result was the quick-detachable clincher tire (called the Q. D. Clincher). The introduction of this tire was facilitated by the simultaneous introduction of the universal rim, which would take either a straight side or a clincher tire by simply reversing the side rings.

While the quick-detachable clincher was a half-way compromise between the clincher and the straight-side types, its introduction at that time was justified because the tire-building art was in a stage of development, not having progressed to a point where everybody was producing a successful straight-side tire. Up to the present time the straight-side clincher and quick-detachable clincher tires have been exploited by their respective backers, and competition has stimulated development of each type. The basic structure of the pneumatic tire has not changed (except by the developments in cord tires) since 1907. The rim details have, however, been undergoing constant progressive development.

Rim Development.

In 1911 the demountable rim began to receive commercial attention. In 1912 several manufacturers put them on cars as original equipment. The demountable rims were soon widely demanded by the public, which of course stimulated their further development. The early demountable rims were heavy. Competition has brought many new light-weight designs, some of which have been carried to such extremes that tire troubles result.

The preceding refers to American practice. In Europe the detachable rim and tire did not succeed in getting a foothold, so that as the industry expanded the use of the soft bead clincher and one-piece clincher rims became firmly established. In Europe four circumstances saved the clincher from the competition of the detachable tire. First, rim-cutting, the worst trouble of the clincher tire, was mastered early. Second, the majority of cars owners in Europe have chauffeurs who change the tires, which amounts to saying that a little saving in tire-applying effort does not interest them. Third, it is rather difficult, especially in England, to introduce new contrivances in competition with those firmly established. Fourth, the demountable wire wheel was one of the early developments in European automobile practise. Its use has been ex-

tended widely, so that if the quick tire-change idea had to be met, it was considered that the demountable wheel was satisfactory. There were no champions of the detachable type in Europe similar to those in America.

Need for European Sizes.

In South America, Australia and South Africa European cars have predominated; naturally the use of millimeter size (European) tires and rims is firmly established. However, during the recent period of trade activity by American manufacturers many inch-size clincher tires and rims have been introduced in these fields. This is most unfortunate because inch-size tires will be used on millimeter rims if the proper millimeter-size tires are not in stock, with certainty of rim trouble. The same thing is true of the application of inch-size tires on millimeter rims. This foreign business is expanding to such volume that the dimensional clincher-tire complication will, unless checked, ultimately react severely against American prospects. American car makers must discontinue the use of inch-clincher (except Ford sizes) and adopt either the millimeter clincher or inch-size straight-sides types.

The straight-side tires are the logical solution. Why should car manufacturers continue to complicate their production processes by equipping some of their cars with millimeter clincher tires and others with straight-side tires, when by proper cooperation between the tire and car makers, the straight-side type, fully perfected and standardized, can be introduced quietly into these markets?

The refinements accompanying the intensive development of the motor car have reached a point where even the weight of the light demountable rim is regarded with disfavor. A return to the simple light-weight detachable rim fitted directly to the felloe of the wheel seems likely. The car designers want to eliminate weight, particularly unsprung weight, at the periphery of the wheel, and to reduce the cost; the car owner desires a maximum of tire service with a minimum of tire trouble. Thus the situation boils down to a case of the survival of the fittest with the demountable rim, the demountable wheel and the simple rim mounted on a permanent wheel on the one side, and the straight-side tire, the clincher tire and the quick-detachable clincher tire on the other.

Three Types of Tires Compared.

The purpose of this paper is to point out the trend of the time in the tire world, and to venture a prediction concerning the future. In order to lay

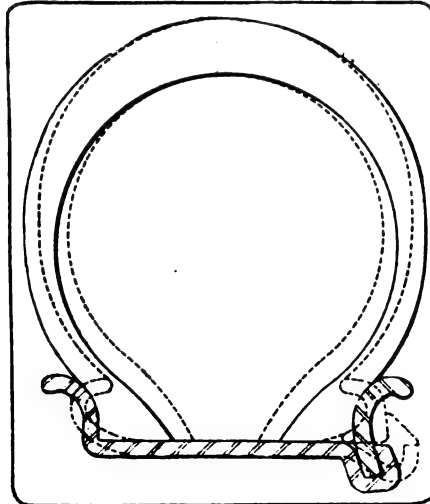


Fig. 1—Straight-Side Tire (Full Lines) Superimposed on Quick-Detachable Clincher Tire (Dotted Lines).

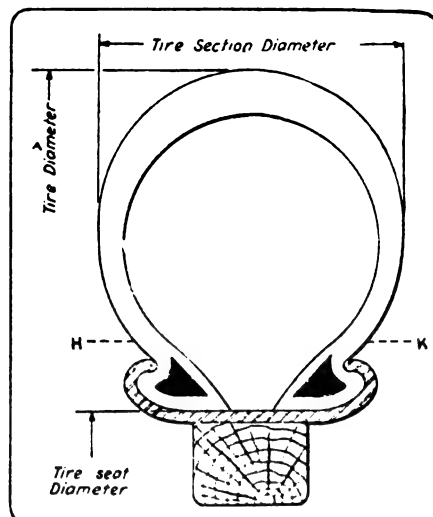


Fig. 2—Soft-Bead Clincher Tire Mounted on One Piece Rim.

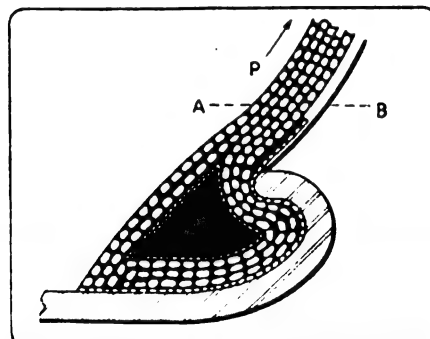


Fig. 3—Details of Clincher Rim and Bead.

proper stress on the points to be brought out, it seems wise to discuss the merits of the three types of tires under the following headings: Energy consumption; traction; total mileage; cost per tire-mile; cushioning effect; reliability; ease of applying; and service.

Figs. 2, 4 and 8 (see appendix) show the straight-side, quick detachable clincher and soft-bead clincher tires that will be compared. The straight-side tire is shown on the wide standard rim. All three tires will be identical in every particular above the line H-K; consequently the energy consumption and traction would be the same for each type.

Factors Affecting Total Mileage.

The total mileage would be influenced by the structure of the tire below the line H-K. While the schemes of attachment to the rims have been largely perfected, the life of the tire is sometimes shortened by a form of trouble commonly called rim-cutting. In a well designed and properly built tire the chances of rim-cutting troubles from causes inherent in the tires themselves are remote. Imperfect rims and various forms of abuse are the actual causes. If a tire is punctured and ridden flat, the clincher

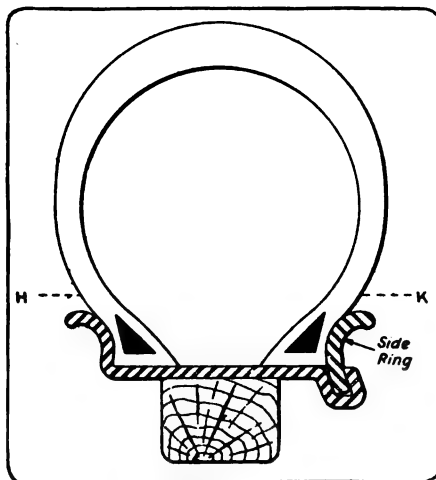


Fig. 4—Straight-Side Tire Mounted on Two-Piece Detachable Rim.

calized at the edge of the clinch with the former, while with the latter the flexing is distributed with less intensity over the gradual curvature of the rim.

Tire-Mile Cost of Operation.

The cost per tire mile is of course a function of the mileage and of the original cost of the tire. Inasmuch as the three types cost the same, the tire-mile cost is directly proportional to the mileage. Since the tires of the different types are alike above the line H-K, the service will average the same for all so far as the upper part of the tires is concerned. Any variation in the tire-mile cost will be dependent on the complications introduced by tire-base troubles. While no specific cost figures can be presented, there is no doubt that the tire-mile cost of the straight-side tire is the lowest. This is strongly emphasized by the domination of the straight-side over the quick-detachable clincher tires as shown in the percentages given in Table I.

Table I—Tire Equipment (In Percent.) on Cars Produced 1913-1916.

Type of Tire	1913	1914	1915	1916
Straight-Side Equip. . .	32	72	84	96
Q-D Clincher Equip. . .	40	28	16	4
Universal Rim	28	...	...	...
	100	100	100	100

Cushioning Effect.

For a given tire section the cushioning effect is largely dependent on the relation between the load and inflation pressure. Lowering the inflation pressure

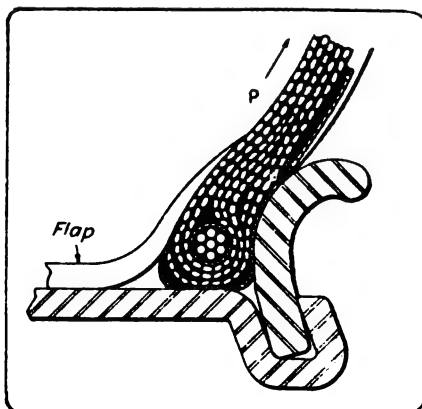


Fig. 6—Inextensible Twisted-Wire Bead.

gives the greater cushioning effect, but on the other hand fabric troubles are greatly increased by excessive flexing of the carcass. In practice it has been found that the best inflation pressure will permit the tread to be depressed 11 to 12 per cent. of the tire section. Since all three types are alike above the line H-K, the cushioning qualities are the same if the tires are operated under similar conditions.

The difference in the rim-attachment structure of the two types has an effect on the cushioning properties. A straight-side and quick-detachable clincher tire of the same size and designed to require the same quantity of raw materials, are superimposed in Fig. 1. This shows that the straight-side tire has the advantage due to the beads of the tire being more widely separated, resulting in a slightly larger diameter of tire section.

Scope of Reliability.

Reliability covers such features as freedom from instantaneous failures and safety considerations. Punctures, blow-outs and fabric breaks occurring in the tread and side-wall portion of the carcass (above the line H-K) are on a par in all three types. Fabric failures at the point of contact with the rim are apt

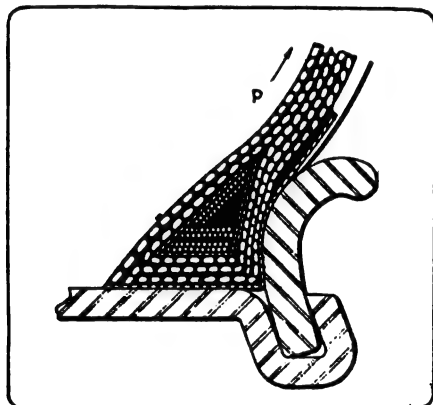


Fig. 5—Inextensible Braided-Wire Bead.

casings and tubes will soon be ruined beyond repair. The clinch of the rim simply gouges into the carcass of the tire and cuts through the plies. At the same time, the tube gets under the toes of the bead, which mutilates it beyond repair. The structure of the straight-side tire, on the other hand, is such that the carcass is simply crushed against a comparatively wide rounding surface. Of course, the straight-side tire and tubes can easily be ruined by this form of abuse, but the chances are three to one in its favor, compared with the other type. The effect of the quick-detachable clincher is about half way between that on the clincher and straight-side tires. In this case the toes of the bead do not lift to catch the tube, but the clinch of the rim gouges into the fabric of the casing to some extent.

Under-Inflation and Overloading.

These are similar in their effects on the structure of the tire, being forms of abuse that aggravate any tendency to rim-cut. The effect is more pronounced on the clincher type than on the straight-side, because the flexing of plies is lo-

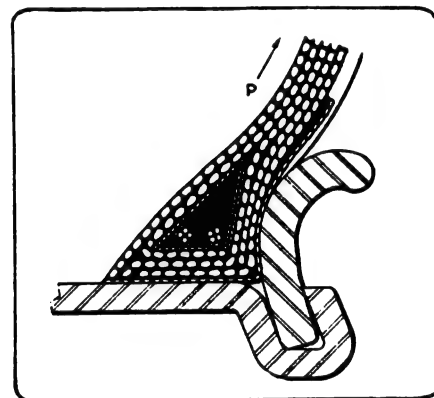


Fig. 7—Inextensible Wire-Cable Bead.

to be more in the nature of a concealed distress followed by sudden failure (blowout in effect) in the clincher and quick-detachable, while the corresponding troubles with the straight-side tires are easier to detect and provide against.

Blowing-off the rim is one of the troubles of bygone days. The early straight-side tires had a good many black marks against them on this account and clincher tires are still occasionally subject to this annoyance. This condition was one of the prime excuses for the introduction of the quick-detachable clincher tire. Because some of the early straight-side tires blew off the rim, certain car makers concluded that this type was not safe. It was not appreciated universally that the straight-side construction is a purely mechanical method of attachment and independent of inflation pressure. At the same time the detachable idea was so meritorious that all tire manufacturers were compelled to put out some sort of a "detachable" tire. Inasmuch as the soft-bead clincher had represented the best practice it was natural to combine the inextensible bead of the straight-side with

the clincher idea in an attempt to provide a detachable tire that would not blow off the rim. In the undeveloped state of the tire-building art it was felt that in order to be perfectly safe a tire must hook under the clinch of a rim. The later development of the straight-side tire has, however, shown conclusively that the problem of safety was simply one of designing the tires to have proper strength at the weak point, so that at present, for every several hundred that fail by rim-cutting and blow-outs, only one tire blows off the rim. How completely the straight-side tire has lived down original prejudices is evidenced by the fact that 529,000 new cars will be delivered on straight-side tires during the 1916 season.

Ease of Applying.

The 3-in. clincher tires are no more difficult to remove and apply than the other types, but beginning with the 3½-in., each larger size is correspondingly more difficult to handle. In applying the quick-detachable clincher tires the bead needs considerable coaxing to get it properly seated under the rim clinch; and the carcass of the tire is often so stiff as to make it difficult to slip the locking ring into place. This is especially true with the oversize tires. The quick-detachable tire is frequently found to be frozen to the rim by rust, thus requiring much effort in removing it. This tire on a split rim is really a formidable proposition; application is difficult and removal almost impossible.

Service refers principally to the distribution of the sizes required by the trade. Owing to the extreme flexibility of the movements of the automobile, competition forces dealers to carry all the sizes in demand in clinchers, quick-detachable clinchers, and straight-side types.

Early in this paper it was stated that the tire and rim questions boil down to a question of the survival of the fittest. The statistics in Table II show very decidedly the trend.

Table II—Tire and Rim Equipment on Cars Produced 1913-1916.

Type	1913		1914	
	No. Cars	Per Cent	No. Cars	Per Cent
Q. D. Clin.....	98,000	24	66,500	19
Str. Side	79,500	19	172,000	35
Reg. Clin.	175,000	41	281,000	46
Univ. Rim.....	67,000	16	none used	
Totals	419,500	100	519,500	100
Type	*1915		*1916	
	No. Cars	Per Cent	No. Cars	Per Cent
Q. D. Clin.....	50,000	8	22,000	2
Str. Side.....	266,000	40	529,000	46
Reg. Clin.	348,000	52	601,000	52
Univ Rim.....	None used		None used	
Totals	664,000	100	1,152,000	100

*Figures are for manufacturers' season—July to July.

It is just a question of time until the quick-detachable clincher will become eliminated. This tire had a legitimate place during the period of development, but with the straight-side tires giving untire satisfaction, there is no excuse for continuing the former type. Dealers have to carry the three kinds of tire with many sizes common to each type. With the quick-detachable clincher eliminated, nearly one-third of the stocks

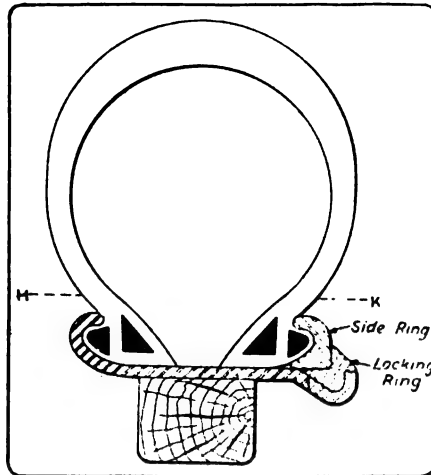


Fig. 8—Quick Detachable Clincher Tire and Rim.

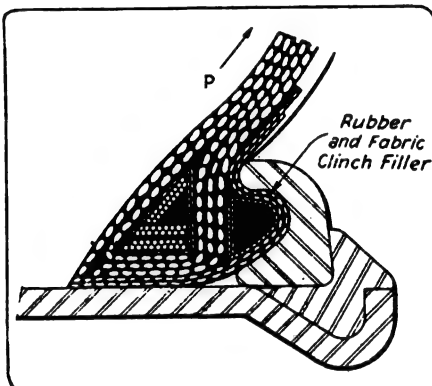


Fig. 9—Inextensible Braided Wire Bead on Quick-Detachable Clincher Tire.

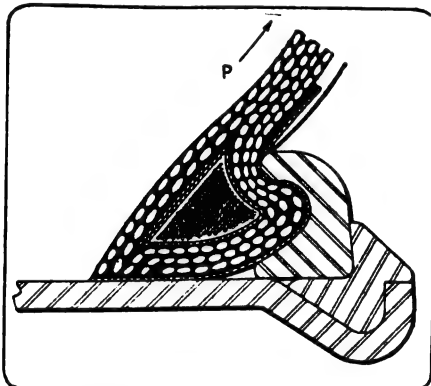


Fig. 10—Bead of Parallel Cords on Quick Detachable Clincher Tire.

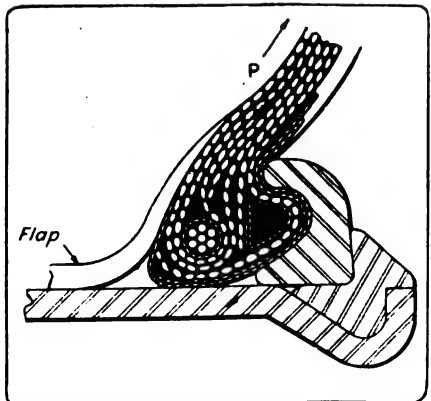


Fig. 11—Heavy Wire Bead on Quick-Detachable Clincher Tire.

could be discontinued, which would mean correspondingly better service on the other two types, less capital tied up in stocks, greater incentive to carry all sizes, and ultimately less expense to the whole industry, and more simplified production.

Tire Equipment of Various Makers.

To further explain the situation, I have prepared the Tables III, IV and V (from published information), showing by size and type the tire equipment used on the principal cars. Pneumatic-tired trucks are not included.

The total estimated production in 1916

Table III—Soft-Bead Clincher Tires and One-Piece Clincher Rims on 1916 Cars.

Name	Tire Sizes	Name	Tire Sizes
Bell	3½	Monroe ...	3, 3½
Briscoe ...	3½	Metz ...	3½
Chevrolet... 3,	3½	Regal ...	3½
Dort	3½	Overland ...	4
Elco	3½	Pullman ...	4
Ford	3, 3½	Scripps-B'th	3½
Maxwell ..	3½	Sphinx	3½

is 601,000 cars using clincher tires and one-piece clincher rims. This estimate applies to the fourteen makers listed in Table III. The total estimated produc-

Table IV—Straight-Side Tires on 1916 Cars.

Name	Tire Sizes	Name	Tire Sizes
Abbott ..	4, 4½	Jackson ...	4, 4½
Allen ... 3½		Jeffery ...	4, 4½
Alter ... 3½		Jones ...	4
Apperson	4, 4½	King ...	4
Auburn ..	4	Kissel ...	4, 4½
Briscoe ... 3½		Lexington	4, 4½
Buick ...	4, 4½ 5	Lozier ...	4½
Cadillac ...	4½	Marion ...	4
Case ...	4	Meteor ...	4½
Chalmers	4	Mitchell ...	4
Chandler	4	Moline ...	4, 4½
Chevrolet 3½		Moon ...	4
Cole ...	4½	Oakland 3½	4, 4½
Daniels ...	4½	Olds ...	4
Davis ...	4, 4½	Palge-Detroit	4
Dodge ... 3½		Peerless ...	4½
Empire ...	4	Regal ...	4
Enger ...	4	Reo ...	4, 4½
Franklin	4, 4½	Ross ...	4
Glide ...	4	Saxon ... 3½	
Grant ... 3½		Studebaker	4
Haynes ...	4, 4½	Stutz ...	4½
Hollier ...	4	Scripps-Booth	4
Hudson ...	4½	Sun ...	4
Hupp ...	4	Overland	4, 4½
Interstate	4	Vellie ...	4

tion in 1916 is 529,000 cars using straight-side tires. This estimate applies to the 52 makers listed in Table IV. The total estimated production in 1916

Table V—Quick-Detachable Clincher Tires on 1916 Cars.

Car	Tire Sizes	Car	Tire Sizes
Cunningham	4½ 5	Pathfinder	4½
Flat	4½ 5	Pierce ...	4½, 5
Locomobile	4½ 5	Premier ...	4½
Marmon ...	4½	Stanley ...	4½
McFarlan ...	4½	Stearns ...	4, 4½
Mercer ...	4½	Stutz ...	5
National ...	4½	White ...	4, 4½, 5
Packard ...	4½ 5	Winton ...	4½
		Westcott ...	4, 4½

is 22,000 cars using quick-detachable clincher tires. This estimate applies to the 17 makers listed in Table V. From the three groups tabulated we observe (1) Clincher tires are confined to 3 and 3½-in. sizes; (2) Straight-side tires are used in 3½, 4 and 4½-in. sizes. (3) The quick-detachable clinchers are confined to the 4, 4½ and 5-in. sizes.

Concluding Comments and Predictions.

The pneumatic tire has passed through its evolutionary stages. Future developments will be confined to refinements intended to eliminate the common tire

troubles, and to increase the tire mileage. The American standard inch clincher-rim contours, the British standard millimeter clincher-rim contours, and the American wide standard inch straight-side rim contours will undoubtedly survive all others.

Outside of the contours, however, rims are still in process of evolution. In the struggle to minimize weight, expense and tire troubles the existing demountable types may lose ground, particularly as the light-weight one-piece clincher and the two-piece straight-side rims, either on permanent or detachable wheels, apparently offer the next step forward.

Extra Types Will Be Eliminated.

We have now uneconomical duplication in sizes in three types of tires performing similar service, but the law of natural selection will effect the elimination of the unnecessary types. Probably clincher tires (in America) will be confined eventually to motorcycle and 3 and 3½-in. automobile tires. Straight-side tires will be used in some 3½-in. and in all larger sizes. The quick-detachable clincher will shortly disappear from use.

The export markets in absorbing American cars will assimilate American constructions more and more readily. Straight-side tires will be introduced into these markets during the coming season as original equipment on some American cars. This type will presently be appreciated as much abroad as it is in America. Thus we are to initiate a step that will result ultimately in a single world-wide standard for pneumatic tires and rims.

APPENDIX.

Figs. 2 to 11 are inserted for the benefit of persons desiring more detailed information on tires and rims. The base portions of the tire in Fig. 2 have sufficient elasticity to permit their being stretched and pried over the edges of the rim when applying and removing it. The extensible bead core is made of semi-hard rubber.

The bead in Fig. 3 is understood to be the entire portion of the tire below the line A-B. The bead core is made of semi-hard rubber, which has just enough stretch to allow it to be pried over the rim. The tires are made about ½-inch smaller than the tire-seat diameter of the rim. This insures a snug fit against the rim and prevents the tube from pinching.

The internal bursting pressure of the air sets up stresses in the direction indicated by arrow P. These stresses are resisted at the hook of the clinch. In other words, a soft-bead clincher tire in its functioning is positively dependent on the air pressure to maintain its shape and position.

In Fig. 4 the side ring is cut in one place and can be removed by prying out with a screw driver. Figs. 5, 6 and 7 show enlarged details of three prominent types of straight-side beads. Each bead is made inextensible by an endless reinforcement of braided wire (Fig. 5), twisted wire (Fig. 6), and wire cables (Fig. 7).

In the type shown in Fig. 7 the fabric plies are tied under inextensible reinforcing wires; thus the side wall stresses (P) are transmitted from the carcass fabric to these circumferential wires. It will be seen that a strictly mechanical method is used to fasten the tire to the wheel in contrast to the soft-bead clincher method, which is analogous to the action of an elastic band. The inside diameter of the tire is slightly greater than the corresponding rim diameter (1/32 to 3/64 in.), which permits the tire to be applied and removed easily.

While the chances of pinching tubes under the beads of straight-side tires is remote flaps are used in the larger sizes as a precaution.

In the quick-detachable clincher rim, Fig. 8, the side ring is endless while the locking ring is cut in one place. In removing the base of the tire and the side ring embracing it must be crowded bodily toward the centre of the rim far enough to clear the inner edge of the locking ring. The locking ring can then be removed by prying out with a screw-

driver, after which the tire and side ring can be removed.

Figs. 9, 10 and 11 show enlarged details of the bead structure of the quick-detachable clincher tire. By comparing Figs. 5 and 9 it will be appreciated readily that Fig. 9 simply shows a straight-side tire with the addition of a clinch filler. This clinch filler is not tied into the body of the bead (by gripping with pliers the whole filler can easily be torn off the tire); consequently it is of absolutely no value in helping to hold the tire in the rim. Its real function is to fill the void that would otherwise exist.

Fig. 11 compared with Fig. 6 shows a similar situation, except that the outside ply of the carcass is laid so as to include the clinch filler. In Fig. 10 the quick-detachable construction closely resembles the regular soft-bead clincher construction. In this case, however, the bead core is made of a mass of cords impregnated with hard rubber extending circumferentially around the tire. The bead of this tire is really semi-extensible.

Detroit Add a Roadster.

Body Is Mounted on Six-45 Chassis.

The Detroit Six-45 roadster, a companion production to the Six-45 touring model, has been announced by the Detroit Motor Car Company, Detroit. The new body, which is mounted on the same chassis as the touring body, is striking in general appearance and has capacity for three passengers. It is provided with a large compartment with a water sealed deck at the rear for luggage. Colors for this model are optional.

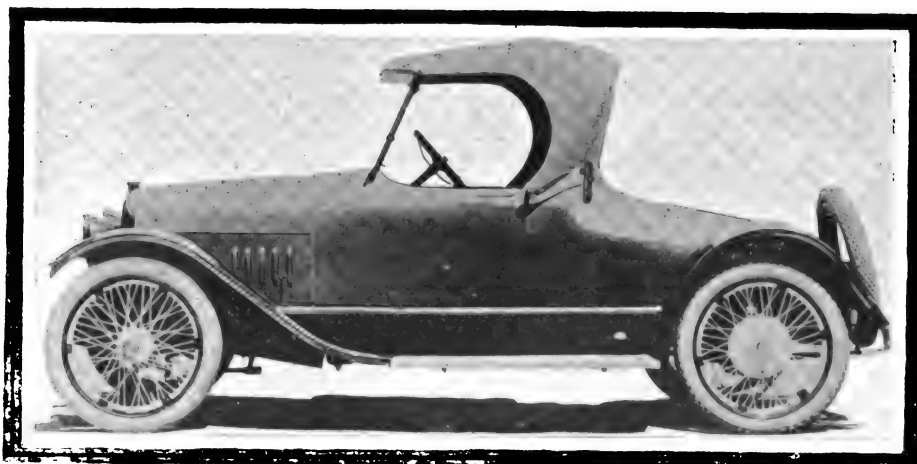
The Continental motor used is a six-cylinder L head type with bore of 3¼ inches and stroke of 4½ inches. The cylinders are cast en bloc with detachable head. Carburetion is by a Ball-Detroit instrument, and the starting and lighting system is a two-unit Auto Lite, starting being effected by the motor operating on the flywheel through a Bendix drive.

Timken bearings and axles are used throughout the car. The steering gear is the irreversible worm type.

The tires are 33 by four and are mounted on artillery type wheels, provided with demountable rims. The windshield is of the approved slanting, self-ventilating, clear vision type, and is designed to eliminate light reflections.

The model is equipped with Stewart speedometer, gasoline gauge, starting and lighting system complete with ammeter, headlight and dimming attachments, ignition lock and key, dash lights and switch, motor driven electric horn, one extra rim, windshield and the usual tools and kit.

The new roadster model is listed at \$1098. Wire wheels are furnished at an additional cost.



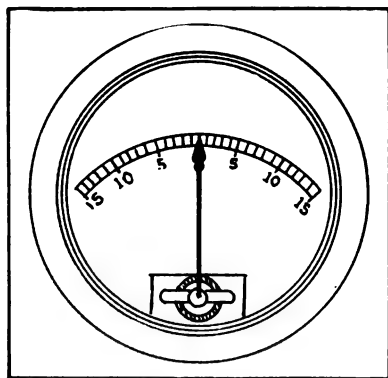
The New Detroit Six-45 Roadster, Listing at \$1098.

MOTOR STARTING AND CAR LIGHTING.

Efficiency of Systems Depends Upon Battery Charging—Use of Ammeter and Voltmeter Indications to Determine Current Flow and Value

THE generator of the current that is supplied for lighting and starting systems may for every purpose be regarded as the point from which examination may be begun, and from this the wiring system of a car can be traced. But tracing a wiring system if all of the leads were disconnected and the owner or repair man had to determine how these leads were connected to obtain the original connections would be a matter of patience and careful study, which would require time and much experimentation. There might be instances where all the leads were taken from the terminals, leaving the wiring in such condition that the repairer, not knowing the character of the terminals, even those of the generator or motor, would not be able to determine the terminals to which of these connections of several leads, for instance, should be made, but such a probability is extremely remote.

First of all every car manufacturer whose ve-



Ammeter with Zero Centre Dial for Measuring Charge and Discharge.

hicles are equipped with electric starting and lighting systems ought to supply instruction books that will have wiring diagrams of the different types of machines built, and the purchasers should obtain copies of the books that are intended for the advice of the owners of these cars. If a man purchases a used automobile and he cannot be supplied the original instruction book furnished with it by the builder, he should immediately communicate with the manufacturer and obtain a copy.

Manufacturers Can Supply Instructions.

There are, no doubt, machines that are no longer manufactured, which are known to the industry as "orphans," and for which no book of instructions can be obtained. With rare instances, however, the equipment can be identified and the name of the manufacturer can be learned. Some manufacturers of lighting and starting equipment publish small books of instruction for the builders of cars, which are intended to supplement the usual car operating instructions. Every maker of car equipment has specifications from which the machines, instru-

ments, fittings and material are selected for each separate vehicle installation, and blue prints or drawings which were originally prepared for the

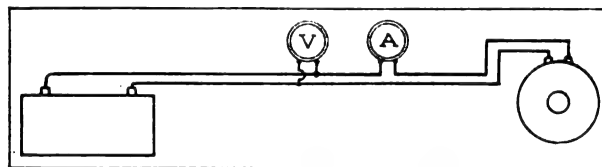
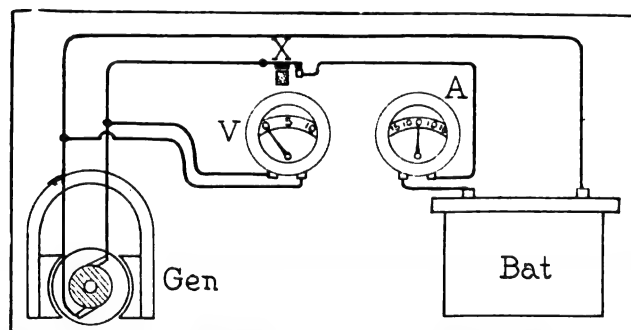


Diagram Illustrating the Theory of Ammeter and Voltmeter Connection, "V" Being a Voltmeter Connected Across a Circuit and "A" an Ammeter Connected in the Lead from the Generator to the Battery.

car builders, and practically in every case where an equipment can be identified, the maker can be communicated with and the information desired may be obtained. Of course with such requests the make, year of manufacture, type of car and a brief description of the system should be enclosed so that the equipment manufacturer can accurately determine just what is required. In the event that there has been change of wiring or fittings that is known, or may be observed from comparison with similar vehicles, this information should be included.

Should the owner neglect to obtain the data that has been advised he must endure the consequences of his negligence, for without question there will be need of it, especially if the machine is much used. In instances where the equipment cannot be identified, a series of tests must be made which will, no doubt, be vexatious and will really be a process of elimination. The owner should not under-estimate the value of information of the electrical systems of his car, because it may be of decided importance to him at any time, and should a system fail and he cannot deal with it practically he will be the loser of vehicle service at least and the expense of restoration will be more or less increased.

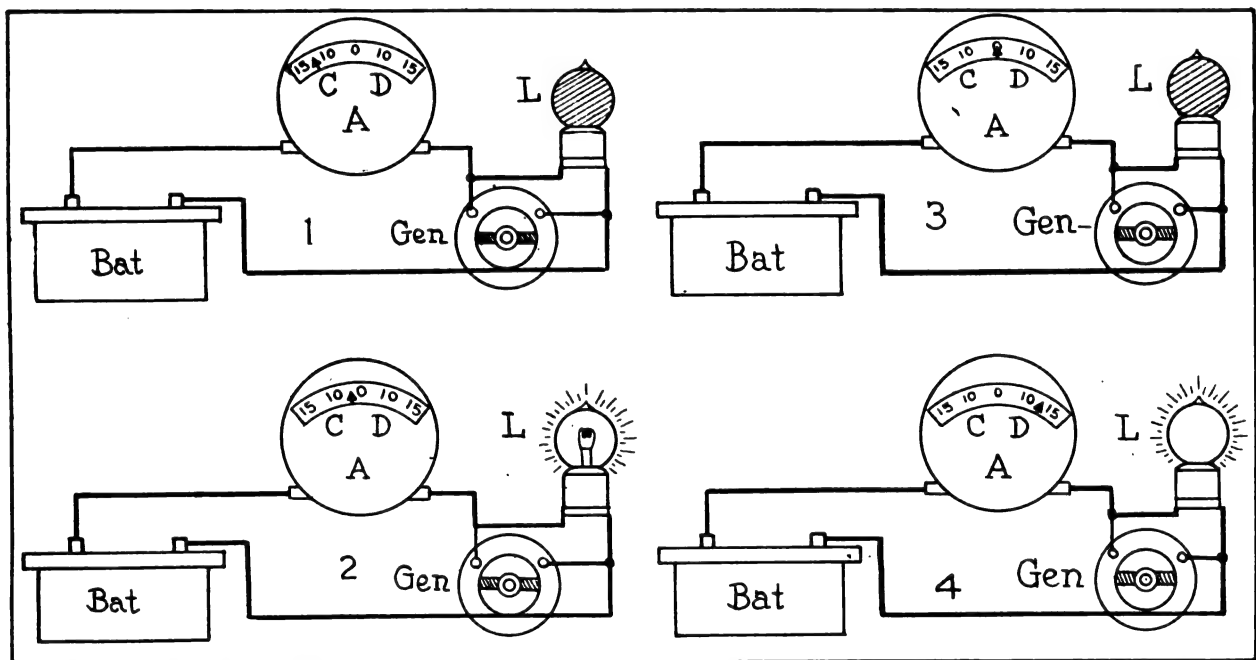
There are four possible conditions for making



Simplified Circuit Current Indication: "X" the Relay or Current Cut-Out in the Main Circuit, "A" the Ammeter in the Positive Side of the Circuit, "V" the Voltmeter Connected Across the Circuit.

tests or examination of car electrical systems, these being the engine idle with the lamps unlighted, the engine idle with the lamps lighted, the engine running with the lamps lighted and the engine running with the lamps unlighted. These will be more fully considered later on, but for the present it will suffice to state that each condition differs decidedly with another and may be logically placed in sequence according to the drain upon the battery. For instance, with the engine idle and the lamps unlighted, there is no demand for current (assuming that the system is normal) even if the system includes ignition. With the engine idle and the lamps lighted the current demand is greatest and the battery is making its greatest discharge and there is no current being delivered to the light circuit. With the engine running and the lamps lighted the

the chassis frame, or the negative terminals may be connected by cable and the positive terminals grounded. But in any event the terminals of like polarity must be connected. There are systems of either type in common use, but generally the positive side of the circuit is connected by cable and the negative side grounded. The reason for this is that the majority of engineers believe that this construction is simpler for those not conversant with electric systems than were the negative side connected. There are numerous makes that have the two-wire system, both sides of the circuit being connected by cable. There are those who prefer this to the single wire, maintaining that there is greater reliability because of the possibility of the ground connections breaking or being affected from galvanic action of dissimilar metals when wet, which causes corrosion.



Characteristics of Ammeter Indications: 1, Engine Running and Lamps Unlighted, Showing Large Charging Flow to Battery; 2, Engine Running and Lamps Lighted, with Small Current Supply for Battery; 3, Engine Stopped and No Lamps Lighted, There Being Neither Charge Nor Discharge; 4, Engine Stopped and Lamps Lighted, the Period of Heaviest Drain Upon a Battery.

current is being delivered from the generator to the lamp circuit, and should there be a slight excess over the energy required to light the lamps, this is carried to the battery. With the engine running and the lamps lighted all the current generated is being delivered to the battery.

How the Connections Are Made.

The generator creates a direct current that must be supplied to the battery, and there must be a circuit which will include the machine and the accumulator for the electric energy. This circuit may be either a single wire (grounded return), or it may be a double wire (insulated return). With the single wire circuit the wire may be connected to either the positive or the negative side, that is, the positive terminals of the generator may be connected by a cable and the negative terminals connected by ground wires to

The lighting system, which is often referred to as including the generator and battery, if the one wire type, may be connected to either the positive or negative side of the battery and all of the lamps, and other fittings and instruments, and the sides not so connected are coupled to the chassis frame by the ground leads. With the two-wire type the circuit is from the positive to the negative terminal of the battery, with the lamps and instruments connected at either side. With the three-wire system the positive and the negative terminals of the battery are connected in one circuit, and the lead from the neutral terminal of the two groups of cells is also connected with either the positive or the negative side, according to the voltage required, and the return of this neutral wire may be either grounded or insulated.

Considering the starting system, if the current be created by a machine that also serves as a motor, the connection with the battery is a complete circuit, with a third or even a fourth terminal, because a different use must be made of the machine, which can only be obtained by the use of different connections, and there must be a very heavy lead from the negative terminal of the battery to the generator. This lead, however, must be through the starting switch, and this side of the circuit must be constructed with substantial connections so that there will be effective conductivity.

If the motor is a separate machine—the two-unit type—the circuit must be through the switch and both sides of the circuit are usually very heavy, so that there will be sufficient endurance.

Connections Are Centralized.

While the connections with the lamps must be made wherever these are located, there must be means of regulation and control, and this entails the bringing of the different leads from the lighting circuit to some central point where they may be operated by means of a series or a combination switch that will control them all, and in some instances there are installations of fuses to protect the battery in the event of short circuits or other failure. When the leads of the lamp circuit leads centre they are usually enclosed, generally by a cover that is seated on an insulated block or base and retained securely by a series of screws. Sometimes there are more than one junction box, but as a rule the purpose is to simplify the system and the number is minimized. Logically the leads of the lamp circuit must also centre at the switch, and sometimes the regulator is combined with this fitting, because of the growing tendency to centrally locate all of the instruments and means of control where they will be within reach or observation of the driver and easily accessible in the event of need.

The Flowage of Current.

The lighting system, when the lamps are unlighted and the engine not running, will show no flow of current in any of the circuits, provided there was means of indication. With the lamps lighted and the engine not running an amperage of from 10 to 15 will be shown, because this is the greatest constant demand that will be made upon the battery. With the lamps unlighted and the engine running to what is equivalent to a road speed that will afford maximum current production, there will be a current flow of from 10 to 15 amperes, and with the lamps lighted and the engine producing practically the same value of current, there will be a charging indication of from two to five amperes.

Current flow is indicated by an ammeter, which will show in amperes the value of the energy flowing through the circuit, and the direction of the flow, but it will not show the pressure or voltage of the current. Current pressure is

indicated by a voltmeter, which will not indicate the current direction. The two instruments in combination will give both indications, but they are seldom used on a single machine, for with the amperage limited by the capacity of the generator and the voltage limited by the battery proportions, and with the lamps to demonstrate the condition of the lighting circuit and an ammeter to show that the generator is charging the battery, a very good approximation of the operative efficiency of the system can be obtained.

Many Variables of Indication.

There are many variables that must be considered in electrical engineering that are not necessarily material in the care of a car lighting and starting system. General knowledge of them, however, will benefit the owner or driver who is maintaining the system. The unit of energy is the watt, which is obtained by a flow of one ampere at a pressure of one volt, and wattage can be learned by multiplying the amperage by the voltage. A generator producing 15 amperes at six volts is yielding 90 watts, which is approximately a normal charging rate for a six-volt battery. But to charge a battery the voltage of the generator must exceed that of the battery sufficient to cause the current to flow against the battery pressure.

The ammeter is placed in the charging circuit between the generator and the battery, because the purpose is to indicate the charging current, and the flow of current from the battery to the lamps, but the ordinary instrument intended for this service will be too delicately calibrated to use it for measuring the flow of the starting current. The voltmeter, however, must be differently located, and the connections must be across the circuit, that is, connected with the positive and negative connections, because it must indicate pressure. The ammeter has comparatively low resistance to a current, but the voltmeter has high resistance, and to obtain indication the current is stopped or obstructed. To be of value in the lighting system the ammeter must be so constructed that it will indicate in either direction, and this result is obtained by a construction with a dial with a centre point, from which the pointer or hand will swing either way to the value of the current.

The ammeter that is desirable for use with an automobile lighting system should be designed to indicate not less than 15 amperes, either charging or discharging, and the dial should be calibrated so clearly that it can be readily read, even by a comparatively dim light. By reference to the accompanying illustrations the several indications during the different phases of charging and discharging can be learned, these showing approximately the maximum readings from an average system, although these do not show the variations that might be obtained during different operating conditions.

(To Be Continued.)



LOCATING DEAD CENTRE.

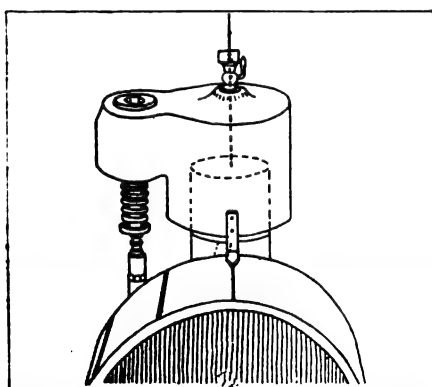
(Figure 209.)

Since smooth operation of a gasoline motor calls for absolutely synchronous timing of the opening and closure of valves, it is customary to adjust these functions by reference to flywheel marks, in connection with a pointer or fixed mark on a stationary part of the motor.

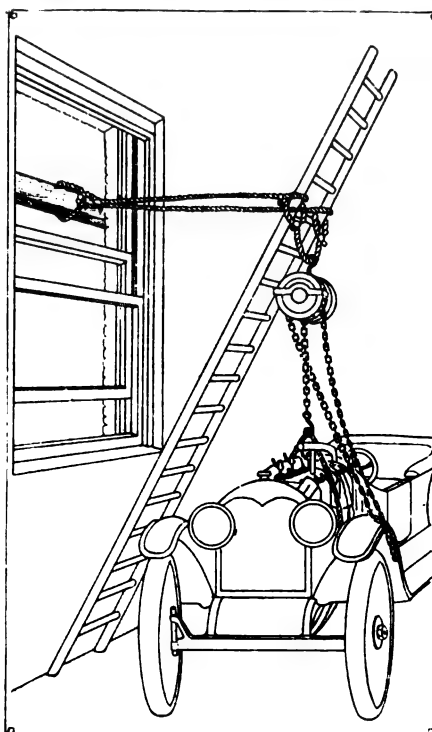
If an owner has a car whose flywheel has not been marked by the maker and he wishes to make his own valve adjustments, as well as to be in a position to know if the ignition is properly timed, he will save time if he proceeds to lay out and scribe the necessary marks across the face of the wheel.

The first thing to do is to attach a pointer to the rear cylinder or, if the wheel runs close to some fixed part of the motor, scribe a vertical line on the stationary part, which will serve the same purpose. Contrive a simple depth gauge, consisting of a stiff wire, with a small piece of cardboard or wood with a saw cut in it, so that it can slide along the wire, but not slip too easily.

Raise the piston of No. 1 cylinder to its approximate dead centre and insert the depth gauge through the relief cock or spark plug hole, resting its bottom on the piston. Slide the adjustable marker down to about $\frac{1}{2}$ inch of touching the top of the relief cock or top of the cylinder (the exact height is immaterial). With all relief cocks open so the flywheel will revolve easily, turn the wheel slowly to the right until the marker comes down and just touches the relief cock, or the top of the cylinder. Being



(Figure 209.)
Locating Dead Centre.



(Figure 210.)
Substitute for Crane.

careful to leave the wheel in this position, scribe a light mark across the face of the wheel opposite the pointer, using a pointed instrument and a try square. Now turn the wheel back in the opposite direction, passing dead centre until the marker again comes down and touches, when a second line should be made on the wheel opposite the pointer.

Now measure the distance between the two lines on the wheel. At a point exactly equidistant from the two lines scribe a well defined line across the wheel. When this mark is opposite the pointer, No. 1 piston is on its exact centre. The dead centre of other pistons may be located in the same way.

SUBSTITUTE FOR CRANE.

(Figure 210.)

When it is not practicable to use a portable garage crane or a block and tackle to remove an engine from a car chassis, a "jury" rigging may be improvised for the purpose. This is done by placing the foot of a ladder against a wall directly under an open window, the

upper end projecting through it and being held secure by being lashed to two by four timber placed across the outside of the window. A differential, or ordinary three shieve falls, may then be suspended by means of a sling from the ladder and the engine easily lifted out. The sling should be wrapped around the sides of the ladder, rather than attached to the rungs, which are generally not strong enough to support the average motor.

An alternate method for use in narrow buildings would be to use two ladders, leaning them against opposite walls and placing a four by four beam across the rungs at a suitable height.

LUBRICATING CLUTCH LEATHERS.

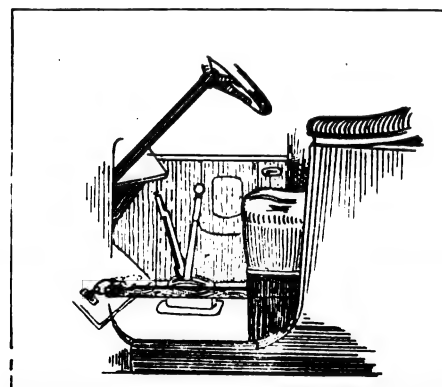
(Figure 211.)

The best method of applying castor or neats foot oil so that it will soak into the clutch leather as it should, is to brace the clutch pedal so as to hold out the clutch for several hours. This can be done by inserting a stick or metal bar between the pedal and the front of the driver's seat and of sufficient length to keep the pedal depressed to the fullest extent. The clutch spring will hold the stick in position. The oil should be applied evenly by means of a stiff feather, hack saw blade or thin blade of wood. Let it stand over night, with the clutch out. On some cars this treatment will work a wonderful improvement.

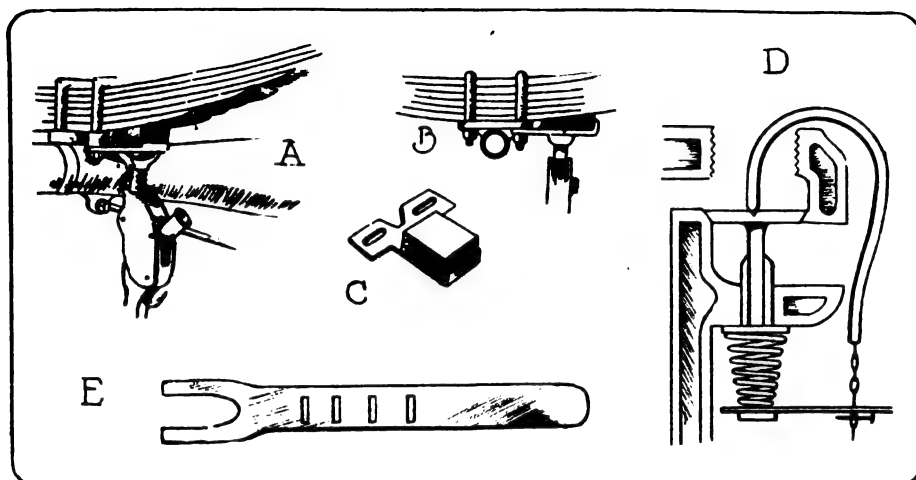
USING JACK UNDER LIVE AXLES.

(Figure 212 A, B, C.)

When it is difficult to jack up the rear wheels because there is not sufficient



(Figure 211.)
Lubricating Clutch Leather.



(Figure 212.)

Using Jack Under Live Axle (A, B, C) and Making a Valve Lifter (D, E).

clearance or a convenient place to apply the upward thrust, the suggestion in the accompanying sketch will be found of value. The device simply consists of a hard wood wedge, or filler, held in place under the spring by a sheet metal clip having two holes which permit its attachment to the rear spring clip. One or two short wood screws could be used to fasten the wood to the metal plate to prevent the wedge working out, the screw heads being let into countersunk holes in the plate. A piece of solid rubber, cut from a solid tire, might be substituted for the wood wedge.

AUXILIARY AIR SUPPLY.

(Figure 213.)

With the present day motor car fuel it is almost an impossibility to set the carburetor so as to obtain both efficiency and economy. This is especially true of motors which have been long in operation. The present fuel generally requires the use of a great amount for starting, after which it is possible to operate on a smaller amount, as the speed of the engine increases. A simple method for achieving this end without readjusting the carburetor is to supply air to the intake manifold.

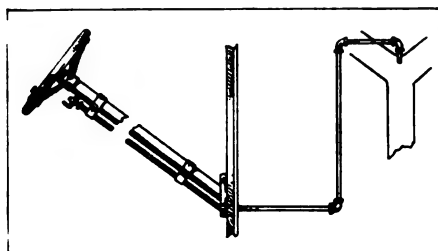
Herewith is shown an arrangement designed for this purpose which is practically self-explanatory. As will be noted a copper pipe fits into the top of the intake manifold at one end and extends along the steering column at the other. At this end a petcock is secured to the pipe. Under ordinary conditions the petcock is kept closed, but as the motor warms and gains speed, the operator should gradually open it until the best operating condition is obtained. The principle involved is to supply additional air as needed and to also break up and convert into vapor any particles of the fuel not atomized by the carburetor. When drilling the intake manifold it is advisable to remove the carburetor so that metal chips cannot fall into it.

MAKING A VALVE LIFTER.

(Figure 212 D and E.)

The valve lifter shown herewith is simple and may be made up at trifling cost. Both its construction and method

of use will be easily understood from the sketch. The large hook is bent up from a piece of stiff steel wire, about No. four gauge, with its lower extremity bent into an eye to accommodate the chain. The forked bar is made of flat stock, about 3/16 inch thick, and has its ends dressed down almost to a chisel



(Figure 213.)

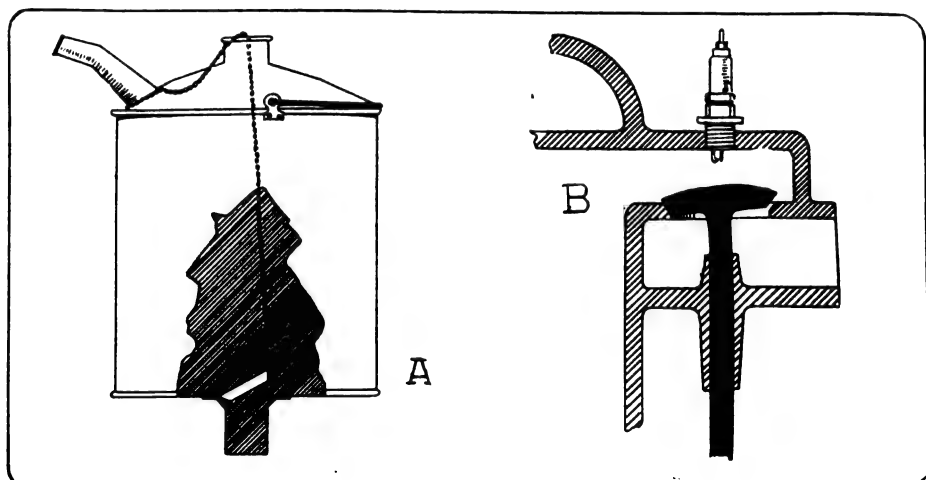
Auxiliary Air Supply.

edge. A series of three or four holes (which may be round) permits adaption to different degrees of overhang of the valve chamber. A small wire nail completes the outfit.

GASOLINE TANK FILLER.

(Figure 214 A.)

A subscriber contributes the idea illustrated on this page. It consists of an ordinary five-gallon can with a six-inch



(Figure 214.)

A Gasoline Tank Filler (A) and a Warped Valve Stem (B).

hole cut in its bottom. A hinged check valve, such as the leather valve which is used in water pumps, is attached to a piece of sheet copper or brass seven inches in diameter, covering a hole in the centre. A light chain is fastened to the check valve and passed through the top of can, being fastened, with a little slack, to the stopper so that it cannot drop back in the can. The plate carrying the valve is now soldered to the bottom of can, covering the six-inch hole. A funnel shaped outlet is then soldered below the valve as shown. Where gasoline has to be carried some distance an arrangement of this kind would undoubtedly be a convenience, as it eliminates the use of a funnel.

PAINT ON CLOTHING.

Motorists when painting their own cars, or when passing through a paint shop, are apt to have their clothing soiled. If the paint is not allowed to dry it can easily be removed by a liberal application of turpentine or benzine. If the spot is not a large one it is advisable to immerse the part in the liquid. Another method is to place a pad of absorbent material under the fabric and then freely sponge the spotted part with benzine. The utmost care must be used so as to prevent spreading the stain.

Varnish stains, if not allowed to dry, may be treated in the same manner, but there is a possibility that the action of the solvent may not be so effective because of the presence of gum rosins.

WARPED VALVE STEMS.

(Figure 214 B.)

Failure of the valve to seat properly some times arises from warping of the valve stem and it is well to see that this is not the case before grinding the seats. The stem may be warped sufficiently to cause it to bind in its guide and retard the valve action, even if it does not prevent it from seating, and many erratic performances of the motor are traceable to this cause. Grinding in such a valve will not overcome the trouble. The only thing to do being to discard the defective valve.



IN describing the construction of the garage shown in the accompanying illustration, which is inexpensive, serviceable and as nearly fireproof as it is possible to make any such structure, no attention will be given to the labor question. The cost of labor varies so widely in different localities and is also dependent to such an extent upon the accessibility of the materials to be used that it is difficult to estimate the item unless all the conditions are known. It also leaves open the question of whether the owner is to do his own work or hire a contractor.

The garage is designed for housing one car and will accommodate any machine now on the market, leaving room for a workbench in the back and ample space on both sides. It is of pipe frame construction with stucco walls and cement roof; with either wooden shingles or tile. In planning the erection of a garage of this kind a number of things might be considered to advantage before commencing work. While new pipe is preferable a considerable saving can be effected through the use of good second hand pipe which is procurable at less than half the original cost. The ordinary pipe T's or X's, which are used for connections or joints, may also be second hand, although care should be taken that the threads are not stripped.

Where a sand bank is accessible, affording a good grade of sand, a considerable saving can be made, as sand is the principle material in cement construction and while it is cheap, the haulage necessitated is expensive where it has to be carried long distances. The selection of the sand is also important. It should be free from humus or loam and

can be tested by placing a small quantity in a preserving jar with some water. Upon being shaken up, it will discolor the water if there is a very large percentage of foreign matter contained. If

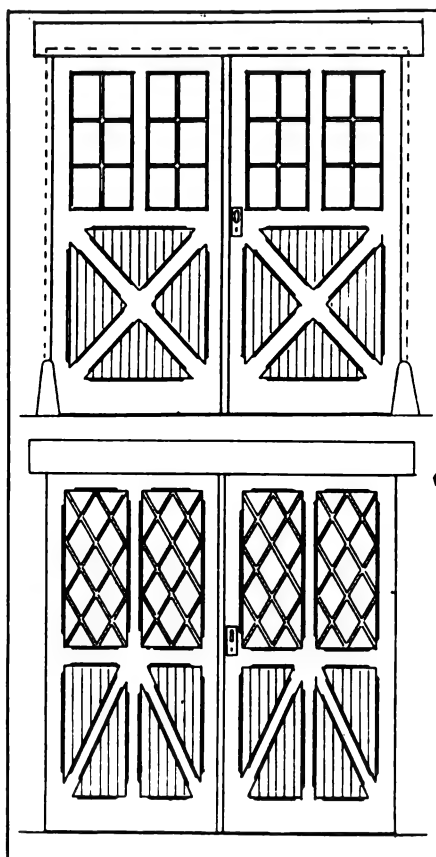
there is a very large amount of loam in the sand it should be washed. Clean sand of any grade from fine to a size that will sift through a screen of $\frac{1}{4}$ inch mesh may be used.

The process of construction is most easily described and can be best followed by starting with the foundation and following out its erection. The foundation walls are 10 inches thick, 18 feet long and 8 feet wide, extending below grade about 4 feet. A concrete mixture of one part cement, two and one-half parts sand and five parts of screened gravel, or crushed rock, is suitable for the foundation material.

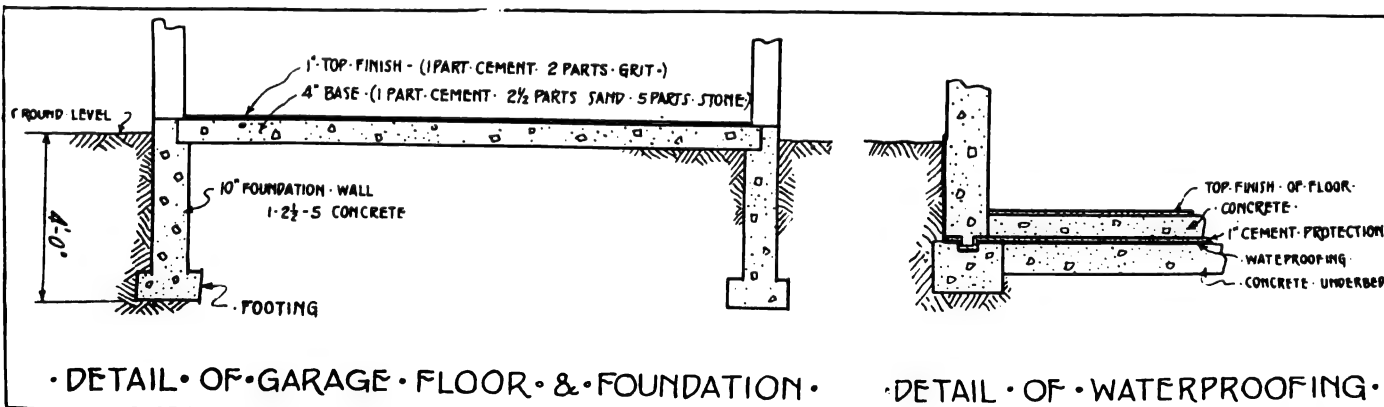
In making the concrete care should be taken not only in measuring out the component parts of the mixture but also in thoroughly working the different materials together. A box with one cubic foot capacity is the best measure for the work, as a cement bag holds approximately that amount. The use of a concrete mixer is most efficient in making the mixture but hand mixing on a small job is just as satisfactory providing it is carefully done.

While the foundation walls are still soft some provision should be made for erecting the pipe studding, either by setting it in the concrete or else inserting pieces of pipe with a hole through them slightly larger in diameter than the outside diameter of the pipe to be used in the frame.

With the foundation completed the builder proceeds in erecting the frame. Any plumber or pipe fitter can make the frame and either deliver it set up or in pieces ready for assembly. If this work is to be done by the owner he will have to provide himself with a strong bench



Double Sliding and Double Swinging Doors.



eight or 10 feet long, a pipe vise, pipe cutter, die stock and two sizes of dies. It would hardly be advisable, however, to buy this equipment when only one frame is to be built and no further use could be found for it. Most houses selling pipe will cut it according to specifications, which is the cheaper method of having it done.

The main uprights in the frame are constructed of $2\frac{1}{2}$ inch pipe and the cross pieces of $1\frac{1}{2}$ inch pipe. The detail of the construction of the frame is

The frame is now ready for the stucco, which should be put on in three coats. One part cement, three parts clean, well graded sand, 10 per cent. of the weight of the cement of hydrated lime and one-half pound of hair per 100 pounds of cement, is the proper mixture for the first coat, which should be scored or scratched so that the second coat will adhere readily.

When this coat has set, but before it has become thoroughly dry, the second coat should be applied. This coat

pebble dash appearance. More elaborate designs of a highly decorative character may be worked out with the use of tile or mosaic work set in the stucco.

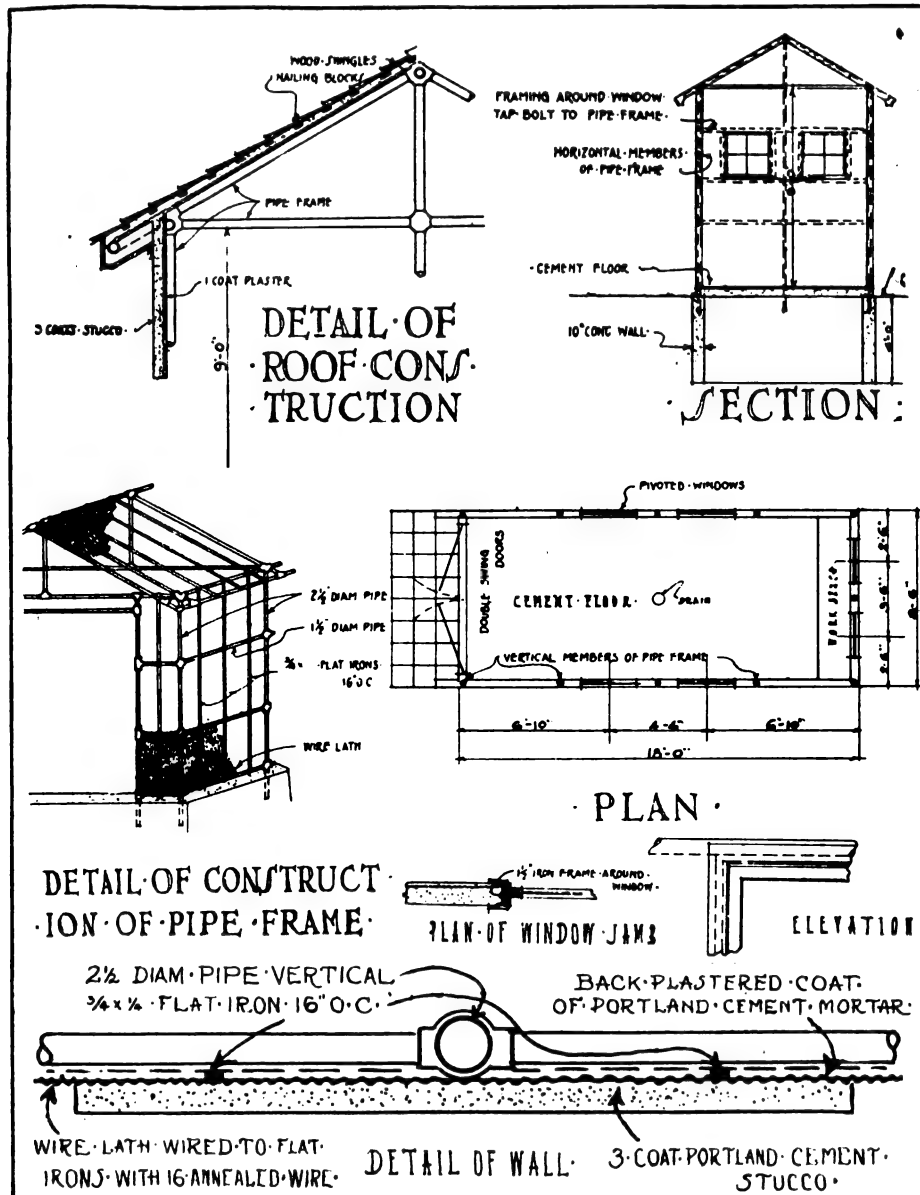
The roof is treated somewhat differently than the walls. After the first coat of stucco has been applied to the lath, beveled wooden strips, $2" \times 1"$, are set in parallel to the eaves from 4 to 5 inches apart. The second coat, mixed of one part cement and $2\frac{1}{2}$ parts of sand, is then applied sufficiently thick to come flush with the tops of the wooden strips which are used as a base on which the wooden shingles or tile are nailed.

With the main building completed the floor base should be prepared for. As a garage should have a floor pit, drain, gasoline pump and sink, provision must be made for these before the floor is laid. The pit, which can be made 4 feet long by 3 feet wide, should be sunk at least 3 feet in the ground with walls 8 inches thick and a $3" \times 3"$ pocket provided along the upper edges to permit a wooden cover to set flush with the floor line. It should be located near the door in a small garage like that described.

After the pit has been installed the drain pipes should be laid to carry off the water from the sink and from the centre floor drain and pipes set to connect with the water system so that when the floor is laid it will practically seal up the bottom of the garage. Where the drain is not to be connected with the sewer system or cesspool, a hole may be dug and a French drain installed by burying a barrel filled with rubble into which the waste water is lead through pipes. This should be placed in the centre of the floor with a piece of vitrified pipe leading into it and with an iron bell top, perforated to prevent waste materials other than water clogging up the drain. When the floor is laid, it should slope toward the centre and it is also a good plan to carry the cement up 8 to 10 inches on the walls forming the floor into a large shallow basin.

Before the floor is laid the ground should be tamped down hard and well rolled as the concrete rests directly upon the earth. Two different mixtures are used in the floor, which should be at least 5 inches thick. The first layer of 4 inches is made of one part cement, $2\frac{1}{2}$ parts sand and five parts of crushed stone or coarse pebbles. The surfacing layer is placed before the first layer is set and is mixed of one part cement and two parts of sand.

The doors are of the double swinging type and should be hung from the frame on strong and stiff hinges. Plain board paneled doors are serviceable but ones with two or four glass panels in the upper half are better, as they admit more light and give a more finished appearance to the building. The window sashes may be either double hung or swung on pivots. Either a metal or wooden sash can be used but the former is preferable in the fireproof garage. Small latticed panes add greatly to the distinctiveness of the finish and make the windows less attractive to burglars as a means of entering the garage.



Plans for Cement-Stucco Fire Proof Garage.

shown in the accompanying plan sketches. Three-quarter inch flat irons are run from top to bottom on the frame and spaced six inches on centres. The roof trussing is constructed after the same plan and the metal lath is wired on. There are a number of kinds of metal laths that may be used, some of which are very rigid, making the structure stronger and more durable. Four $1\frac{1}{2}$ inch channel iron frames of the proper dimensions are tap bolted to the pipe frame in the right locations for the windows. Similar provisions are made for the door frame.

should be mixed the same as the first except that only $2\frac{1}{2}$ parts of sand are used and no hair. Great care should be taken in applying this coat as it is the one in which the lines are brought out. The finish is developed in the third coat which may be colored to match the residence of the owner.

The best results are obtained through the use of white portland cement with white sand. If no pigment is added this will give a beautiful white finish. Surface finish may also be made in several designs before the third coat has set, by roughing or giving it a splatter dash or



MARTIN TIRE COVERS.

Tire manufacturers are impressing upon car owners more than ever before that they should keep the spare tires protected from light, rain, dust, etc. For this reason a majority of motorists are in search of suitable covers. The Martin line consists of tire covers, water buckets, inner tube cases and similar goods. These are made of heavy imitation leather. The tire covers are made in various styles and are designed to fit the different tire mountings.

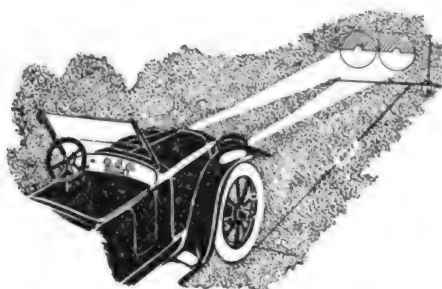
The Martin automobile bucket will be of special interest to the motoring public. It is made of special dull black, finished water proof duck. When not in use it can be folded flat or rolled up and carried behind or under the seat.

The Martin line is well worth the investigation of anyone, as the products are of the highest grade.

Manufactured by the Martin Manufacturing Company, Lancaster, O. Write for descriptive circulars and prices.

FRACTO.

Fracto is a glass shield that regulates the blinding rays of headlights by directing them upon the reflector so that the full efficiency of the lamps may be obtained to illumine the roadway as required by law. It does not destroy the majority of upward rays but corrects their projection by focusing them upon the road. Fracto has two foci, one for projecting and the other for a local field of illumination. The top half of the reflector can project a powerful light about 400 feet, while the lower spreads the rays at a distance of 10 feet and at a width of two feet. The maker guar-



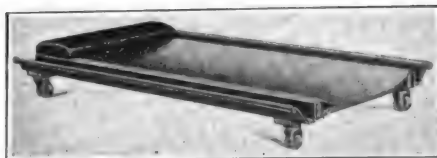
Projection of Light by the Fracto.

antees the Fracto, when properly adjusted, will bring the rays from the headlight within legal requirements.

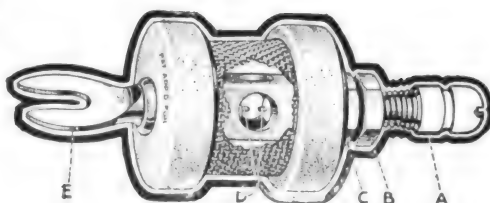
Manufactured by the Fracto Specialty Company, 356 Newbury street, Boston, Mass. Price \$2.75 per pair.

P-S-E PLUG ENERGIZER.

The P-S-E plug energizer is a highly scientific attachment for the cylinders of any internal combustion motor, such as is used in motor vehicles, for the purpose of breaking, or gapping, the electric current on its way to the electrode in order to obtain increased power and flexibility, noticeable economy, a visible spark at the plug, a reduction of wear and tear of parts, and the positive prevention of spark plug troubles. The device is shown in the accompanying illustration. It is adjustable and quickly fitted to any ignition system by simply screwing it down on the plug and fastening the terminal between the nuts at the other end. The contact points are made of a metal that can neither burn nor oxidize, and the end caps and inner core are of non-conducting composition to ensure durability and prevent current leakage. Ventilation to prevent oxidation of the points is effected by means



Mecco Auto Creeper.



P-S-E Spark Plug Energizer.

of a wire gauze. The maker has published a very interesting and highly instructive description of the device, as well as of the causes of the troubles which it is designed to overcome. It is free upon request.

Manufactured by the P. S. E. Manufacturing Company, 158 West 50th street, New York, N. Y. Price \$1 each.

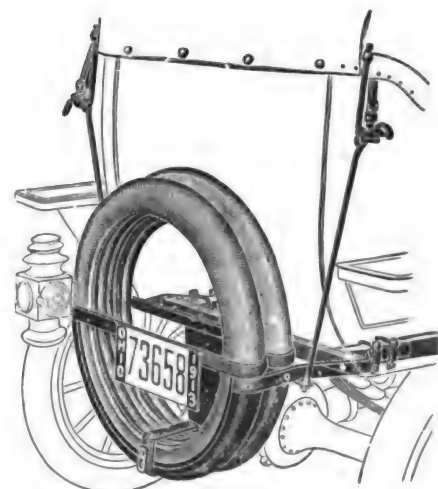
OPCO CARBON REMOVER.

Opco carbon remover is an oil mixture for cleaning every kind of a gas engine cylinder of carbon encrustations. The maker asserts it is absolutely harmless to everything except carbon, which it destroys. It is inserted through a priming cup, spark plug taps or intake manifold. In ordinary cases about four ounces is sufficient for each cylinder, it being injected while the motor is warm. After setting for about five minutes the softened carbon will be ejected through the exhaust when the motor is again started. In extreme cases a little more of the mixture is required. The carbon remover is guaranteed.

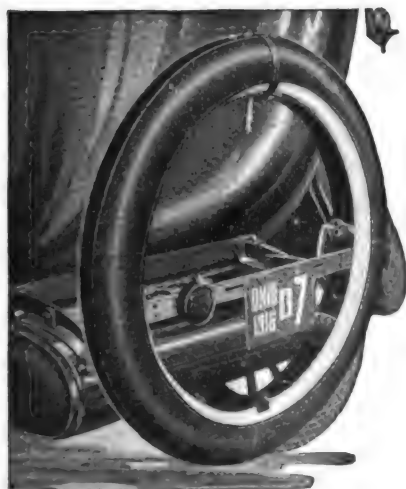
Manufactured by the American Oil Products Company, 1426 Seneca street, Buffalo, N. Y. Price \$1 per quart can.

THE LECTROFLATER.

Lectroflater is the trade name given to an ingenious combination of a universal electric motor that will run on either alternating or direct current, a high pressure air compressor, gear box and condensing chamber so arranged that all elements are enclosed in a single housing and automatically cooled by a patented system which requires no liquid.



New Era Tire Carrier.



Martin Tire Cover.

All bearings, gears and pistons are automatically lubricated from a central source by a capillary system. There is no liquid lubricant or oil level to maintain and consequently there can be no flooding or can oil vapor reach the tires.

The instrument is equipped with a long electric cord, high pressure gauge, hose and quick acting coupling. Connection can be made to any lamp socket.

These machines are made in two sizes. The No. 1 size is particularly suited to private garages, while the No. 2 size, which has two and one-half times the capacity of No. 1, is intended for public garages, tire sales rooms and like places where there are heavy demands for air. This model is also furnished mounted on a light seamless steel tubular carriage, having large diameter wheels and a tool tray. Either size can be furnished for mounting permanently on the wall.

Manufactured by the Black & Decker Manufacturing Company, Baltimore, Md. The No. 1 size, \$45; No. 2, \$65, or when fitted with carriage, \$80.

MECCO AUTO CREEPER.

When work must be done from underneath the machine, nothing adds greater to the comfort of the work man than a good creeper. One of the best of these is the Mecco auto creeper, illustrated herewith. This device will enable inspection or repair of the bottom of the car without soiling clothing or the necessity of lying on a cold, uncomfortable floor. Statement is made that the smooth, steel, curved body and soft head rest make the creeper almost as comfortable as a bed. The pockets on each side are convenient receptacles for tools, nuts, bolts or other small parts.

The Mecco is 36 inches in length and 20 inches in width. It is made of sheet steel formed over a wood frame work and mounted on four casters. The soft head rest is part of the regular equipment.

Manufactured by the Moeschl-Edwards Corrugating Company, Inc., Covington, Ky. List price, \$2.

IDEAL HOSE CLAMP.

The paramount feature of the Ideal hose clamps is that they are guaranteed not to buckle or cut the hose. They can be slipped over a pipe regardless of its position and can always be returned to the original shape by tightening the screw. The clamp is a two-piece device and when tightened bears at all points on the hose, positively eliminating all leakage.

Distributed by J. H. Faw, Inc., 41 Warren street, New York City. Write for price list of water and steam clamps.

TIRE HOLDER COMBINATION.

Included in the large variety of New Era automobile specialties is a combina-



The Lectorflater.

tion lamp, number plate, tire holder and lock especially designed for the Ford car and given the trade name "Sly Perfect." It is made of pressed steel, black enameled, forming a snug cradle for each tire. The construction also incorporates a thief proof snap lock.

A deflector plate affords positive protection to the tires against the exhaust heat, smoke and oil. The number plate holder, lamp bracket and lock are a fixed part of the holder.

Either tire can be removed without disturbing the other. Complete instructions accompany each holder sold and no drilling or cutting is necessary.

Manufactured by the New Era Spring & Specialty Company, 877 Woodward avenue, Detroit, Mich. Write for booklet showing complete line of accessories.

PERKINS VAPORIZER.

The Perkins vaporizer is a simple device that is clamped to the exhaust pipe and heats the gasoline before it enters the carburetor, resulting in a highly combustible mixture which, the maker declares, absolutely gives eight miles more per gallon of gasoline used. This claim has been proven in actual tests. The vaporizer can be attached easily and quickly, without soldering and without tools. It is designed especially for Ford cars and is built on a scientific principle, that of heating the gasoline before it reaches the carburetor. By this means the fuel particles are broken upon into comparatively minute globules, allowing the air to mix with them more readily and resulting in fuel economy and greater power.

Manufactured by the Perkins Appliance Company, Springfield, Mass. Retail price, installed, \$5.

P. D. Q. SPARK PLUG.

In the P. D. Q. spark plug the body and insulator are two separate units, it being possible to remove the insulator from the shell without the use of tools by simply pulling up on the bail, thereby releasing the eccentric action on the shell. A convex ground seat in the shell is forced with great pressure against a ground surface on the porcelain, making the joint leak proof and removing the necessity of using a gasket. Severe tests have demonstrated that the plug cannot leak compression, according to the maker. The quick detachable feature makes for ease in priming the motor in cold weather and for ease of cleaning, for both electrodes are carried in the insulator. As regards economy, the porcelains may be purchased separately, which are procurable at about 25 per cent. lower cost than the original complete plugs.

Manufactured by the Wolverine Spark Plug Company, Detroit, Mich. Prices quoted by the maker upon request.



P. D. Q. Spark Plug.



Ideal Hose Clamp.



Perkins Vaporizer.



The Plug with the Green Jacket

Let's know your
motor =

We can supply
you with the
right plug.

SPLITDORF ELECTRICAL CO.
NEWARK, N.J.

There is no porcelain
to break away and
score cylinders
in the mica
insulated.

SPLITDORF SPARK PLUGS

They're
easily cleaned
and it is never
necessary to
throw them away.

Look for the name SPLITDORF on the Green Jacket, which is hexagonal in shape. Refuse imitations or "just as good" substitutes. The SPLITDORF Trade Mark appears on every SPLITDORF PLUG, and the Trade Mark carries the SPLITDORF GUARANTEE.

Graphic Items from the Fortnight's News.

Magistrate Frederick B. House of the Traffic Court, New York City, issued a warning that after August 1 he would impose jail sentences without the alternative of fines, upon autoists or motor



car drivers who are guilty of flagrant violations of the automobile laws relating to speed.

In less than two months over 60 people were sentenced to jail for exceeding the speed limit but these drastic measures apparently had little effect on the New York motorists, consequently the authorities are going to show little leniency hereafter to the reckless operators.

Harold F. Oxley, of Providence, R. I., was recently fined \$300 and sentenced to three years in jail for stealing automobiles. According to the police of that city Oxley, a musician by profession, has been a regular offender.

A movement is being started in New Hampshire to have the state legislature amend the automobile statutes, permitting car owners from other states to remain in that state 30 days without taking out a license for their cars. The present grace period is 10 days.

The counties of the lower peninsular of Michigan have paid \$1,410,148.19 into the state treasury for automobile licenses and the total of \$1,466,974.38 has been received from the entire state. Half this sum, or \$733,487, is paid back to the different counties, in proportion to the amount collected from them, for road work.

Black and white will be used as colors on the new license tags for Kansas automobiles instead of the yellow and black plates used last year.

Over 200,000 automobilists have taken out licenses in the state of Illinois so far this year. This number compares with 175,000, the total number issued in 1915.

All the horse-drawn equipment that was in service on the rural free delivery routes in Kenosha county, Wis., has



been abandoned and the mail carriers now use automobiles.

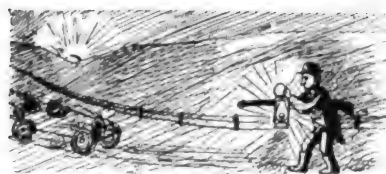
The City of New York has been upheld by the appellate division of the

state court in its right to require the installation of oil separators in all garages where more than four cars are stored.

In Wisconsin the per capita investment in automobiles is over \$30 and there is an auto for every 20 of the population. The increase in the number of machines in use there during the past five years is 1300 per cent.

The department of public roads and rural engineering of the U. S. department of Agriculture is planning to take up the work of determining the actual draw-bar rating, weight, fuel consumption and other factors in the operation of farm tractors.

An automobile race, which was without either the sanction of the A. A. A or the courts, resulted in the contestants being haled before the bar of justice and fined for exceeding the speed limit. This unique contest was staged in Maine, between Augusta and Winthrop, and de-



spite the fact that the drivers broke all existing records between these two points, and incidentally had to contribute \$10 apiece toward the maintenance of the state, it was declared no race on account of the number of accidents befalling both cars.

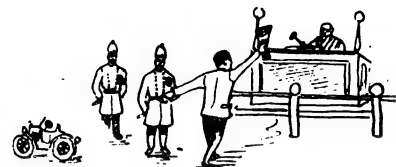
One of the contestants made the distance of 10½ miles from Augusta to Winthrop in 11 minutes. The race was held at sunrise in order to avoid traffic on the course and to keep the police from interfering.

The motor vehicle commissioner of the state of New Jersey has announced that the new law requiring all automobiles to be equipped with mirrors, affording the operator a rear view, will be strictly enforced.

The Boston street commissioners after making a number of tests of the devices to maintain safety zones in congested districts have decided to give them a trial and a number will be installed immediately. If the system of protecting pedestrians who are about to enter street cars proves successful the plan will be carried out generally throughout the city.

A Boston automobilist when haled into court at Nahant, Mass., for exceeding the speed limit in that town, it being claimed that he was making 32 miles an

hour when arrested, offered the novel alibi that his car was incapable of any such speed. To back up his contention he offered to bet the Judge or anyone else in the court \$100 that his machine



could not exceed the comparatively slow speed of 18 miles an hour. No one took his bet but the court nevertheless maintained its attitude toward his guilt and he was assessed a fine of \$5.

The Maine Automobile Association has issued a bulletin in which all automobile owners in that state are requested to use light dimmers. This request was made as the state of Maine does not require it of automobilists but the members of the association realize that the use of dimmers is a necessary precaution in preventing accidents in the night time.

The drop of 10 cents a barrel in almost all grades of crude oil produced in Kansas, Oklahoma and Texas is generally taken as an indication that gasoline prices will soon be reduced. The oil interests are still maintaining that conditions warrant the maintenance of present prices, but it seems certain that any further drop in crude oil prices will have to weaken the gasoline market as there are large stocks of oil in storage. Another new element entering into the situation is the greatly increased production which has been stimulated by the high prices. Drilling has been going on at an unprecedented rate wherever it is believed that oil will be struck.

Automobile cars of unusual design are being used in carrying passengers up Mount Tamalpais in California. The machines carry 20 passengers in addition to the driver. They are propelled by 60 horsepower, water cooled engines.

In many cities the official dog catchers have adopted the automobile in pursuing their duties. One New Englander holding this office has a wire cage on the rear of the car and a "dog catcher," so that it is unnecessary to even handle the canine. When he arrives at his pound,



if the dog is to be executed, he backs up to the execution chamber and opens the rear doors of the cage. After the dog has gone into the chamber it is sealed up and chloroform or gas administered.

MERGER RUMORS STILL PERSIST.

Names of Large and Well-Known Car Makers Are Linked in Talk of Combinations.

There is a new rumor of a gigantic automobile merger being circulated about in Wall street, and it is persistent despite the fact that no confirmation can be secured. The rumor in its present form is to the effect that J. N. Willys is making efforts to form a holding company to take over the Willys-Overland, the Packard and the Peerless companies, and that the securities would be offered through Kuhn, Loeb & Co. This concern, or the Willys bankers, would not affirm or deny the story. The Auto-Lite Company and the Fisk Tire Company, which were to have been involved in the recent merger that fell through, will be included in the new deal according to the talk in financial circles.

G. M. C. EARNINGS HEAVY.

Gross sales of \$144,000,000 for the first 11 months of the fiscal year are reported by the General Motors Company, an increase of over \$58,000,000 as compared with the figures for the same period last year and more than \$50,000,000 more than the entire gross of the entire preceding fiscal year.

The company produced 121,113 automobiles during the 11 months ending June 30, which exceeds the production of the entire fiscal year of 1915 by 43,045 cars. Undivided profits on the same date were \$24,500,000, as compared with \$11,686,280 on the corresponding date in 1915.

NEW STROMBERG COMPANY.

The Stromberg Carburetor Company of America, with \$250,000 capital, has

been incorporated at Albany, N. Y., to take over the Stromberg Motor Devices Company of Chicago. The new concern was organized by Allan A. Ryan & Co. of New York City, together with a number of other New York financiers. It is planned to enlarge the production of the concern and 37,500 shares of stock have been issued and offered to the public at \$42 a share.

STEWART-WARNER PROFITS BIG.

The preliminary balance sheet of the Stewart-Warner Speedometer Corporation for the first six months of 1916 shows net profits of \$1,275,000, which is equal to 13 per cent. on the company's common stock. The directors also voted to set aside \$307,463 to retire a large block of preferred stock. A dividend of 1½ per cent. was declared on the common stock, payable Aug. 1 to stockholders of record July 22. The balance sheet as of June 30, 1916, shows total assets of \$14,425,908.

CHALMERS DIVIDEND.

Regular quarterly dividends of 2½ per cent. on the common stock and 1½ per cent. on the preferred stock of the Chalmers Motor Company have been declared, payable Aug. 1.

TO BUILD HEAVY TRAILERS.

The Warner Manufacturing Company, Beloit, Wis., manufacturer of the Warner auto trailer, will shortly place upon the market a line of heavy duty trailers

of two, three and five tons capacity. The production will be under the personal direction of A. P. Warner, who has been experimenting with the trailer for the past two years. The Warner trailer coupling, also manufactured by this concern, will be standard equipment on a number of well known makes of trucks during the coming year.

HEAVY GOODRICH EARNINGS.

The earnings of the B. F. Goodrich Company for the six months ending June 30, 1916, were \$4,800,000, an increase of \$800,000, or 20 per cent. over the corresponding period in 1915. The net earnings during 1915 were \$12,265,000.

The regular quarterly dividend of 1½ per cent. on the preferred stock has been declared, payable Oct. 2 to stockholders of record Sept. 1. The regular quarterly dividend of one per cent. on the common stock, payable Nov. 15 to stockholders of record Nov. 3 was also declared.

ALTER PLANT IN GRAND HAVEN.

The Alter Motor Car Company, which has been conducting its manufacturing operations in Plymouth, Mich., will erect a brick and steel factory in Grand Haven, Mich., where the company will establish its plant. Additional capital will be put into the concern and the output will be largely increased.

Jeffery Becomes Nash Motors.

New Corporation Formed by C. W. Nash
with a Capital of \$5,000,000
in Maryland.

The Thomas B. Jeffery Company, Kenosha, Wis., which was acquired by Charles W. Nash, former president of the General Motors Company, under partnership operations with Lee, Higginson & Co. of Boston, has been incorporated under the laws of Maryland in the name of the Nash Motors Company.

The capitalization is \$5,000,000 preferred and 50,000 shares of common stock of no par value. The stock was offered in Boston in blocks of four shares of preferred and one share of common stock for \$400. With no debts the Nash Motors Company is in an excellent financial position. For the fiscal year ending June 30 the profits of the company are estimated at \$2,000,000 and the car production during that period was 8424 units, composed of 5749 pleasure cars and 2675 trucks. The company makes 90 per cent. of the parts for its cars, which is said to be as high a percentage as is made by any manufacturer of automobiles.

KRIT ASSETS \$13,000.

The final reports filed in the case of the Krit Motor Sales Company, which



"THE CAR WITH THE \$500,000 MOTOR."

Benjamin Briscoe, President of the Briscoe Motor Corporation, Entertaining Friends While He Drives the New Briscoe 24, the "Car with the \$500,000 Motor."

became bankrupt in 1914, have been filed and show about \$13,000 of the concern's assets on hand. The sum of \$81,126 was realized from the sale of the company's property and the total disbursements were \$67,883, of which \$65,047 was paid out in dividends to creditors.

ARGO BECOMES HACKETT.

The Argo Motor Company, Jackson, Mich., will hereafter be known as the Hackett Motor Car Company as a result of the control of the concern passing into the hands of Mansell Hackett. A new model, the Hackett Four, is announced by the company to sell at less than \$1000.

BUYS SPARK PLUG PLANT.

The V-Ray Spark Plug Company, Marshalltown, Iowa., has been purchased by the Stewart-Warner Speedometer Corporation, which will continue the manufacture of the V-Ray plugs in the new plant being erected in Chicago.

PRICE OF DORT ADVANCED.

The price of the Dort touring car, manufactured by the Dort Motor Car Company, Flint, Mich., has been raised to \$695. The old price was \$665.

Ford Announces Big Reductions.

Beginning Aug. 1 the Touring Car Sells at a Price \$80 Lower Than Last Year.

The Ford Motor Car Company has announced a reduction in prices of the various models of the Ford car, which makes the fifth cut in price in as many years. The reduction, which amounts to about 18 per cent. on all models, brings the price of the chassis alone to \$325 as compared with \$360 during the past year. The touring car model will sell at \$360, which is a reduction of \$80 from the price which prevailed up to Aug. 1. The other prices which became effective on that date are as follows: Roadster, \$345; Couplet, \$505; Town Car, \$595, and Sedan, \$640. These prices are a reduction of \$45, \$85, \$45 and \$100 respectively on the different models.

It has also been announced that the new models will be altered materially in appearance, the hoods sloped and with crowned fenders. A radiator with lines to harmonize with the new general design of body type has also been adopted.

In the spring of 1913 the Ford plant reached a productive capacity of 1000 cars daily; at present it is 2000 cars. It is understood that with the new plant facilities now in course of installation that this capacity will be nearly doubled.

CONSOLIDATE THE KELSEY PLANTS.

Four Huge Wheel Companies Merged in One Holding Company with \$13,000,000 Capital.

The Kelsey Wheel Company of Michigan, the Kelsey Wheel Company of Canada, the Kelsey Wheel Company of Tennessee and the Herbert Manufacturing Company of Detroit, have been merged into one company with \$13,000,000 capitalization. John Kelsey will be president of the new company.

A limited amount of the common stock of the new concern has been offered to the public at \$55. A part of the \$3,000,000 preferred, which is seven per cent. accumulative, has also been offered. It is expected that the stock will be listed on the New York stock exchange.

The financing plan is unique. The \$10,000,000 common stock will carry all the voting power and no dividend can be paid on this class of stock until the surplus has reached the sum of \$500,000, at which time six per cent. may be paid, but nothing in excess of that amount until there is a surplus of at least \$1,000,000. Three per cent. of the \$3,000,000 preferred stock will be redeemed at \$125 a share each year.

The Kelsey companies, although less than seven years old, had net tangible assets on Dec. 31, 1915, of \$2,500,000, and at present have \$10,000,000 worth of orders on their books and nearly 3500 people in their employ. During the first six months of this year the sales totalled \$3,949,222, on which profits of \$590,525 were shown.

It is stated that the contracts on hand for 1917 delivery call for 625,000 sets of complete automobile wheels and to provide for this production the erection of two new buildings and a power plant have been started at the Tennessee plant. The enlarged plant will have a

capacity of 1500 sets, or 6000 complete wheels daily. An addition of over 300 men will be made to the force in Memphis, making 1000 employees connected with that plant.

ACCESSORY MERGER RUMORED.

A big accessory merger is said to be planned with a combined capitalization of \$35,000,000 to \$45,000,000, to include the Perfection Spring Company and 10 or 11 other concerns now doing business in Cleveland and other cities. It is understood that the consolidation, if it is effected, will not involve any large financial operations.

LOCOMOBILE CO. PROSPEROUS.

The Locomobile Company of America, Bridgeport, Conn., manufacturers of the Locomobile line of pleasure cars and the Riker trucks, did a gross business during the quarter ending June 30, 1916, of about a million dollars more than during the same quarter last year.

PRINE JOINS PATHFINDER.

H. W. Prine of Pittsburg has been appointed district sales representative of the Pathfinder Company of Indianapolis, Ind., for the eastern Pennsylvania territory. His duties will be largely of an educational character among the dealers.

T. F. Flanagan, formerly assistant advertising manager of the Pyrene Manufacturing Company, has been appointed sales manager of the concern to succeed C. Louis Allen, who has been elected president.



CHALMERS TRAILBLAZER PILOTS TO YELLOWSTONE.

The Yellowstone Park Sociability Tour from Minneapolis to the National Park, Was Piloted by the Chalmers "Trailblazer" Last Month, It "Participating" in the Dedication of the New Bridge Over the Little Missouri River, the Last Link in the Chain Connecting the Northerly Transcontinental Route.

Trade Personals.

News of the Prominent Men of the Industry—Promotions and Other Changes.

the same duties that he assumes in his new position. He also was secretary and auditor of the Nernst Lamp Company and treasurer and auditor of the Westinghouse Lamp Company of Bloomfield, N. J.

CHALMERS ADDS TWO MEN.

C. H. King and J. P. Winterson, well known figures in the automobile business for the past decade, have joined the selling organization of the Chalmers Motor Company.

Mr. King has been identified with the



C. H. King, Chalmers.

FRIEND JOINS U. M. C.

Alfred P. Sloan, Jr., president of the United Motors Corporation, which is the parent company of five of the best known accessory concerns in the automobile business, has appointed Otis C. Friend as his assistant and J. D. Arnold as general auditor.

Mr. Friend goes from the Mitchell-Lewis company, where he has served in an executive capacity for 12 years. He first became connected with Mitchell-Lewis in the selling department. After organizing the first purchasing department the concern had, he became assistant factory manager and later manager. He returned to the sales department of the company four years ago as assistant sales manager and advertising manager, and during the past two years and up to the time of his resignation was general sales manager.

Mr. Arnold has been connected with a railroad, a mail order house and an electrical manufacturing company with



Fred Cardway, Packard.

Chalmers car for nearly 10 years and prior to that time was with the Motor Car Sales Company of New York City, agents for the Thomas-Detroit, which was the predecessor of the Chalmers. His territory will lay in the eastern section of the country.

Mr. Winterson was at different times connected with the Lozier Motor Company at their New York branch and with the Chandler Motor Car Company, and was a travelling salesman for the latter concern, covering the entire country, excepting the Pacific coast. He has been with the Chalmers company since July 1.

CARDWAY IN SOUTH AMERICA.

Fred Cardway, who has devoted much of his business life to promoting foreign trade between nations, will make a trip into South America next month in the interest of the Packard Motor Car Company and will take with him a Twin-Six and a chainless truck, as well as an ex-



J. P. Winterson, Chalmers.

pert driver and mechanic.

The Packard Company had received many applications from South American business men who wanted to establish Packard agencies there and Mr. Cardway will visit these men to ascertain their qualifications for undertaking the business.

VER LINDEN OLDS MANAGER.

E. Ver Linden has been appointed general manager of the Olds Motor Works, Lansing, Mich. His promotion followed the resignation of Jay Hall and the abolition of the Olds executive committee, which formerly had charge of the management of the plant. Mr. Ver Linden is well known in the automobile industry, having been manager of Plant No. 1 for the Buick company. Previous to that position he was in business for himself under the corporate title of the Michigan Auto Parts Company, which was purchased by the General Motors Company.



Otis C. Friend, U. M. C.



E. Ver Linden, Olds.

SUGGESTIONS FOR THE FORD CAR OWNER.

Some Characteristics of the Rear Axle and Driving Shaft Units--Removing the Wheels with a Hub Cap Type of Puller and by Striking with a Lead Hammer.

The 53rd article dealing with the operation, construction, maintenance, care and repair of the model T Ford chassis is the 14th of the series devoted to adjusting, restoration and overhauling.

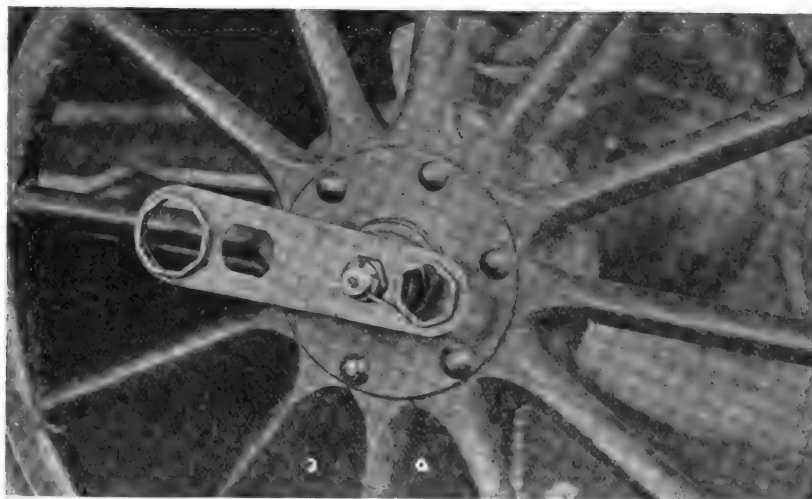
REMOVAL of the driving shaft housing and the radius rods from the rear axle will leave the axle housing and the wheels as a unit, and, of course, supported by the wheels. The axle may be trussed, for a considerable number of owners believe that they can strengthen the construction by carrying a truss rod from end to end, which is extended under the differential housing of the shell, and which is anchored at either end to clamps or lugs that encircle the case. At the forward side of the differential housing there is a series of six studs that are set into the case and by which the rear end of the driving shaft is bolted.

The disassembling of the driving shaft unit may be at the same time the rear axle is worked on, but it has been taken up progressively from the forward end to the rear, as this is the logical manner for the description. The driving shaft housing consists of the steel tube with the steel casting at either end, that at the forward end being the case of the universal joint and the other a short flanged sleeve, that are fitted to the outside diameter of the tube itself. The tube is somewhat tapered at the forward end to fit the bore of the sleeve of the universal joint housing, and when the assembly is made at the factory the bab-bitt bushing is placed in the tube before the universal joint housing is fitted. The sleeve of the universal joint housing is secured to the tube by a series of four rivets.

The flanged sleeve at the rear end of the driving shaft housing tube is similarly riveted to the tube and this flange is bolted to the casting that carries the Hyatt roller bearing. Reference has been made to the bushing and the bearing as being very enduring and there being little probability that they will evidence wear, even in long service, but there are possibilities of the rivets retaining the castings becoming loose because of some exceptionally heavy stress, and instances have been known where the tube itself will be broken. There is no reason to apprehend there will be failure either of the rivets or the tube, but when work is being done on the shaft housing

the owner or driver had best make careful examination to learn whether the housing is in good condition.

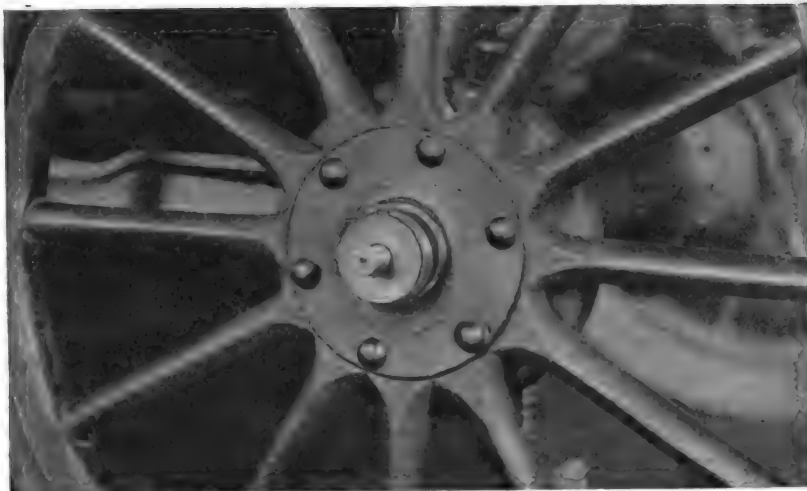
The roller bearing is a standard type of considerable size and it is essentially a series of rolls carried on spindles that are mounted at either end in rings, so that there is slight lateral movement of the spindles, and the rolls are enclosed in a sleeve or shell that in reality is a race or track on which the rolls of the bearing may revolve. The sleeve is split at a slight angle to the axis of the bearing from a point midway its length, the two legs of the angle being equal. The edges of the sleeve are so formed that when the sleeve is compressed to its smallest diameter they are evenly seated against each other and the vertex of either side must register exactly. This sleeve will expand slightly when released from compression, but when compressed it will have an



The Rear Axle Jacked and the Wrench Placed for Removing the Castellated Nut—The Cotter Pin Partly Withdrawn.

unvarying diameter.

The rolls are helical coils of steel that might be likened to springs, with the convolutions very close together. The bores and external faces of the rolls are very carefully finished. As the rolls revolve there is a screw-like movement of the coils, which has the effect of distributing any lubricant evenly on the surfaces of the rolls, spindles and the sleeve. The bearing surfaces are $2\frac{3}{8}$ inches length and are designed to take the side pressure of the shaft over so large an area that there will be comparatively little if any wear. When the bearing is slipped over the shaft it may be moved freely along it, but when the bearing sleeve is seated in the housing there



The Driving Shaft with the Nut Removed, Showing the Outer Hub Flange and Threaded End of the Hub.

is no play whatever and yet there is free movement of the shaft and the rolls.

The driving pinion is a bevel or cone type that meshes with a large bevel gear that is mounted on the differential gearset housing in the rear axle, and as the teeth of the pinion and gear turn there is both a side and a forward or thrust pressure. The roller bearings sustains the side pressure, but the thrust would carry the shaft ahead through this bearing were not a ball bearing carried in the same housing as the roller bearing. This thrust bearing consists of an annular race that is seated against a shoulder formed on the shaft, in which is a series of balls, and there is a collar that forms the rear of the bearing in which is a shallow race to maintain the position of the balls. The roller bearing is seated against the rear race of the thrust bearing and when the roller bearing is pressed into its housing it is retained in position by the keyed pinion and the castellated nut and the pin.

The wheels of the Ford chassis are constructed of wood and are what is known as an artillery type, the hubs being of steel, the spokes and felloes of wood and the rims of steel, with flanges formed at either side, making channels into which the beaded edges of the tires are engaged and retained by pressure when inflated. The wheels are built with 12 spokes each and with changes of hubs are interchangeable. That is, aside from the different hubs for the front and rear axles the wheels are identical. The wheels are equipped with the same size of tires so far as wheel diameter is concerned, but the rear wheels

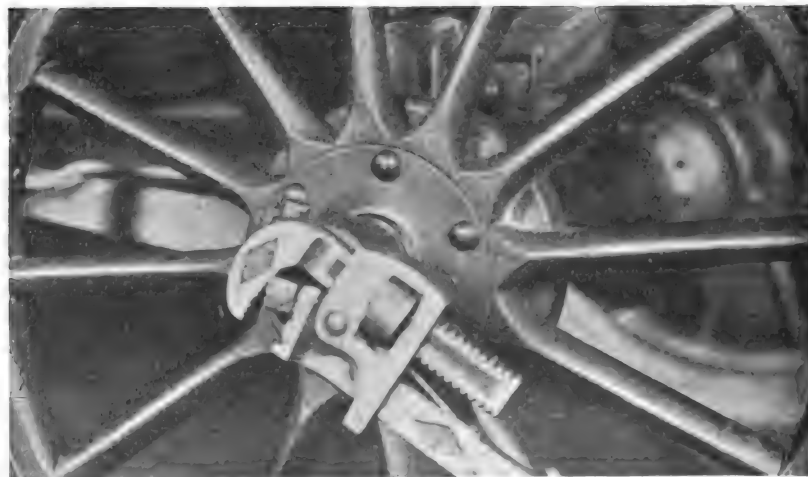
are usually fitted with tires that have a half-inch larger cross section and are stronger and more enduring than those used on the front wheels.

The first step in disassembling the rear axle is to remove the wheels, and as the axle is a semi-floating type, that is, the wheels are mounted directly on the driving shafts, they must be taken off. To do this the axle must be jacked, and because of the nature of the work that must be done on it there is the best of reason why this should be done with a substantial type of jack or the axle should be supported by a pair of horses after it has been raised. The first test that

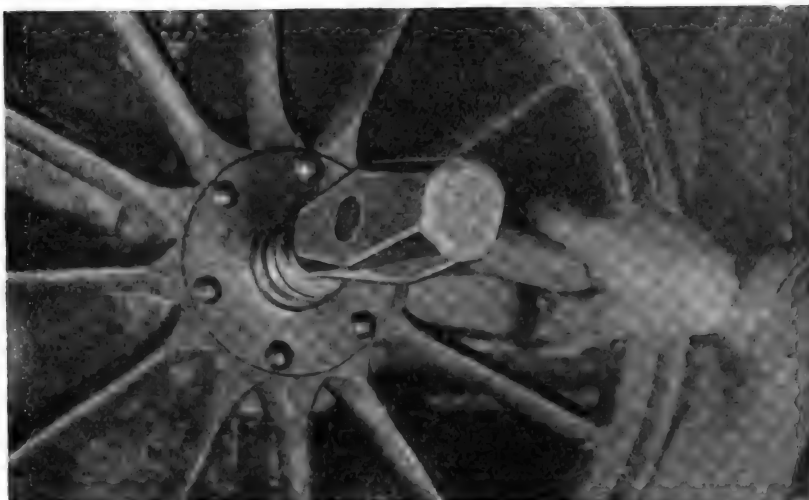
should be made after a wheel has been jacked is to lift the wheel and lower it to determine whether there is play of the outer end of the shaft to which it is assembled in the roller bearing in the end of the axle housing.

How the Shaft Carries the Load.

The axle shaft is a steel forging that is locked into the differential gearset assembly. The differential gearset is carried on a pair of Hyatt roller bearings, and there is a similar bearing at each outer end of the axle housing. There will be more or less play of the shaft in the outer bearing after a considerable period of use, the degree depending upon the character of lubrication the bearings have had. The steel of the axle shaft is machined where the axle is carried by the roller bearing, and if the lubrication has been insufficient or the machine has been driven for a long time, this shaft will be worn by the rollers of the bearing. The bearing rollers are hardened and heat treated and are intended to endure



Using a Hup Cap Type of Wheel Puller with a Stillson Wrench Set on the Driving Bolt of the Tool.



Manner of Loosening the Tapered End of the Shaft in the Hub by Striking It with a Lead Hammer.

heavy duty. The metal of the shaft is as a rule softer and will wear to a greater or less degree, but, of course, varying conditions have more or less influence.

As the weight of the chassis is supported by the axle bearing where it contacts with the shaft, the wear of the metal is necessarily from the shaft, and when this wear has been demonstrated and restoration is desirable there are no means of compensation. The bearing will be found to be practically little worn, and possibly it may be equally as good as when new, but the axle must be replaced. Jacking the rear axle and testing the wheels and the shaft bearings is a wise precaution. It should be done frequently, as the condition of the shaft can be learned only by having the wheels clear of the ground.

Removing the Rear Wheels.

Removing the wheels from the axle is not necessarily a work to give the owner any concern, but he ought to be equipped with the tools that are required for the several operations. The hub caps should be started before the axle is jacked, because considerable force may be necessary to turn them, and this can be better applied when the weight of the unit will be upon the wheels. Hub cap wrenches are included with every kit of tools supplied with new Ford cars, and these are practically always available. The first illustration shows the rear axle jacked and the hub cap removed, with a wrench fitted over the castellated nut that retains the wheel on the spindle, the cotter pin being almost wholly withdrawn from the end of the shaft.

The second illustration shows the castellated nut re-

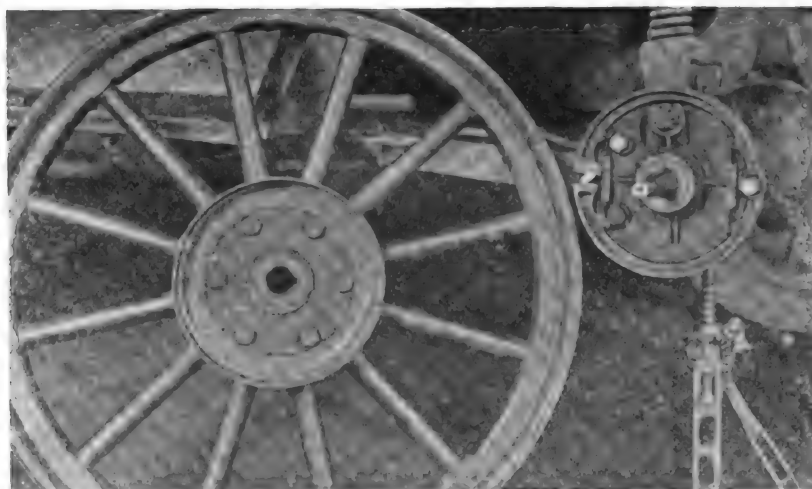
moved from the end of the shaft and the outside end of the hub, the spokes being retained between the hub flanges by six bolts that have the heads on the outside of the flange. The third illustration shows the hub cap replaced by a wheel puller that consists essentially of a heavy steel cap, through the centre of which a hole is drilled and tapped, and into this tapped hole a substantial bolt is screwed that is threaded practically its entire length. When the wheel puller has been seated on the thread of the hub the bolt will be centred on the end of the axle shaft and then by tightening the bolt with a wrench of sufficient length to have the re-

quired leverage, the wheel, which is keyed on to the tempered shaft end, can be drawn off. This is the certain manner of pulling a wheel, but when such a puller is not at hand the wheel can very generally be loosened by striking the end of the spindle with a lead hammer, which will not damage the threaded shaft end. If the shaft appears from the test for play to be considerably worn, there may be no reason for preserving it, and it may be practical to use a steel hammer, but this can be done with a block of soft metal if no other tool is available. The fourth illustration shows this method.

The Brake Assembly.

The fifth illustration is made with the wheel removed from the shaft and shown reversed, so that the brake drum and the nuts of the six bolts by which it is secured to the wheel are visible. The brake drum is eight inches diameter and it is pressed steel. The key way in the bore of the hub is clearly seen.

(To Be Continued.)



The Wheel Removed from the Axle Shaft, Showing Interior of the Brake Drum and the Brake Shoe Mounted on the Axle Flange.

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Photograph No. 1



Photograph No. 2



Photograph No. 3



Photograph No. 4



Photograph No. 5

Special Uses for Tarvia

The main field of usefulness for Tarvia, of course, is the building and maintenance of macadam roadways. So many special uses have been discovered by our own engineers and others in various parts of the country that we have published a special 48-page book describing in detail fourteen special uses for Tarvia with photographs and other evidence of interest. The booklet is entitled "Special Uses for Tarvia". It will be sent free on request. We reproduce herewith a few of the photographs and data which appear in the book.

Photograph No. 1—This concrete road on Sixth St., Mason City, Iowa, was built in 1912. This concrete pavement has been successfully repaired with Tarvia, thereby greatly prolonging the life of the road at trifling cost.

Photograph No. 2—Tarvia has solved the problem of what to do with a worn-out brick pavement. Such a pavement makes an excellent foundation for a wearing course of Tarvia concrete, giving a smooth, noiseless and durable surface at a very low cost. The old brick pavement on Grant Ave., Vandergrift, Pa., was resurfaced with Tarvia.

Photograph No. 3—Plank floors on bridges wear out very rapidly. Traverse City, Mich., covered the floor of this bridge with "Tarvia-X" and stone chips with good results.

Photograph No. 4—The least expensive way of keeping a road in a private estate or park is by using "Tarvia-B". "Tarvia-B" is applied cold, soaks into the road and hardens. It forms a handsome, dustless surface which is ironed out, not abraded by traffic. This photograph shows the main driveway in Centennial Park, Nashville.

Photograph No. 5—For patching old roads of water-bound macadam asphalt macadam or even sheet asphalt and brick, Tarvia with broken stone is ideal. These patches are easily and quickly made.

Many cities now keep Tarvia on hand for ready repair of dangerous holes, replacements on account of openings in pavements, etc. This photograph shows a road in Hingham, Mass., repaired with "Tarvia-K-P".

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This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by any one interested.

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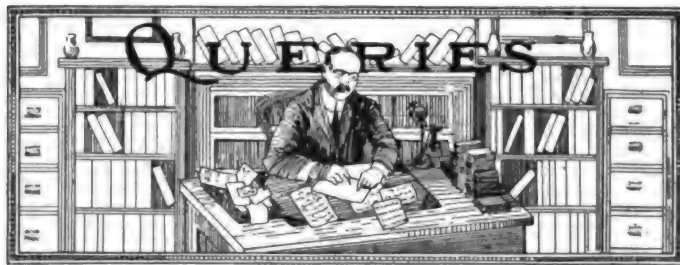
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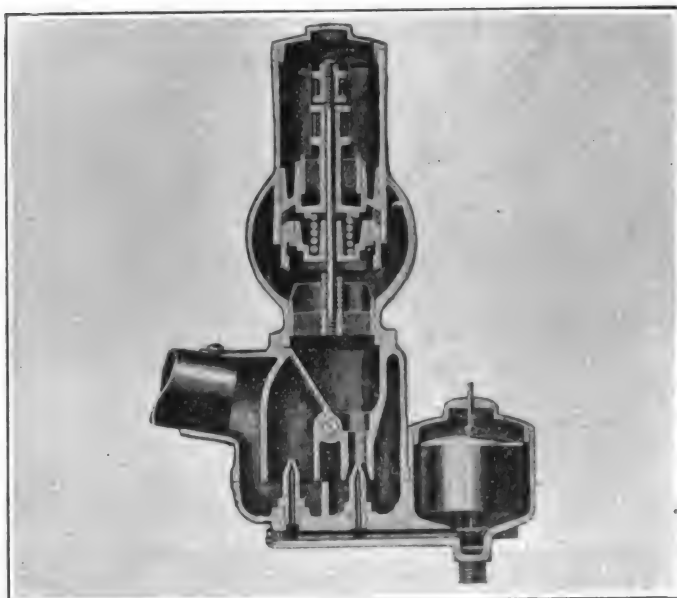


ACTION OF SAURER AIR BRAKE.

(D. B. J., Boston, Mass.)

I understand that on the Saurer truck the engine is used as an air brake, by making some change in the valve timing which causes the engine to act as an air compressor. If this works out well in practice, and is accomplished without much complication, why has it not been generally adopted, especially on heavy trucks on which brake linings have rather a short life in very hilly sections? Will you please describe how the brake works?

The Saurer air brake, so called, is made to function by a patented arrangement of the exhaust cam shaft. This probably accounts for its not being generally used, as it is not only efficient, as a brake, but has other advantages, and these



Cross Section of Saurer Air Brake.

are secured without complication in design and, presumably, very little added cost.

This truck, although now made in this country, is a product of Switzerland, where very long, steep grades are quite common, and where the ordinary type of friction brake, unless water cooled, would overheat to a serious extent. The engine, acting as a compressor, also tends to heat up, but the water cooling amply takes care of this, so that this truck could descend a very stiff grade of indefinite length without any wear or overheating.

The pistons are made to compress air on each up stroke, instead of alternate strokes, this being brought about by the provision of a spiral key way on the front end of the exhaust cam shaft. This is engaged by a key in a sliding muff, or sleeve, which is moved longitudinally on the shaft by controlling mechanism in much the same manner that some of

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Champion Ignition Co., Flint, Mich.

the earlier magnetos were advanced by the spark lever.

When the brake is put in operation the cam shaft is advanced 90 degrees, with relation to its normal position, or 180 degrees with respect to the crank shaft, equivalent to one stroke of the piston.

Starting with the first down stroke of the piston, the inlet valve is opened and a full charge of air sucked in. This is compressed on the up stroke. When the piston reaches top centre, or a little before, the exhaust valve opens (owing to advance timing of cam shaft) and the pressure is suddenly released by the expulsion of air into the exhaust manifold. On the down stroke this same air is sucked back into the cylinder. The exhaust valve closes when the piston reaches bottom, so that compression again takes place on the next up stroke. On next top centre the inlet valve again opens, releasing the pressure, and a suction stroke follows as before. It will thus be seen that each up stroke is against compression, that there is considerable frictional resistance to the sudden release of the compression at the top of stroke, and that each downward thrust is a suction stroke, with partial vacuum tending to hold the piston back.

The control of the brake, by the driver, is by means of the same lever, located on top of the steering wheel, used to actuate the throttle. By a special carburetor and throttle construction atmospheric air is admitted to the inlet manifold when the brake is applied, so that no gas is wasted.

Aside from the ease of control, this brake has two pronounced advantages, viz.:—Regardless of road surface the use of the engine brake cannot cause skidding, as the braking effect is reduced as the wheel speed is reduced and released altogether if the wheels stop, so that it is impossible to lock the wheels.

The other advantage is the elimination of adjustments, replacements, and other attention required by friction brakes on heavy vehicles.

It is understood that the patent affecting this construction will shortly expire, if it has not already, as it has been a feature of the Saurer truck for about 14 years.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

OXYGEN IN MANIFOLD.

(J. T. C., Chicago, Ill.)

Would it be practical to use oxygen, mixed with the gas in the intake manifold, to burn out carbon in cylinders? This could be easily done by placing a small pipe, or rubber tube, connected with an oxygen tank in the carburetor intake, or in a small hole in the manifold above the throttle valve. In the case of my own engine, the only access to the combustion chamber is through the spark plug holes. Before trying the other way I would like to know whether there is any danger of damaging the cylinders or any other objection to it.

There is no reason why the method you describe would not produce the desired results. It would undoubtedly take considerably more of the oxygen, as only a small percentage of the volume entering the cylinders would be in contact with the walls and available to combine with the carbon to form combustion.

Generally speaking, no danger would attend its use unless the throttle were opened fairly wide, in which case the more rapid combustion of the gasoline, air and oxygen mixture would result in high initial pressure, which might strain the engine parts.

If you experiment in this direction it would be well to have the motor well warmed up, the throttle closed to the slowest idling position, and the carburetor adjusted to give the leanest possible mixture before opening the valve on oxygen tank.

PARAFFINE WAX IN FUEL.

(M. G. D., Elizabeth, N. J.)

I understand that some motorists use paraffine wax in gasoline. Does this increase the explosive value of the fuel?

If there is any advantage to be gained it is only that of lubrication. By placing wax in gasoline you would simply be putting back that which was taken out in the distillation of the crude petroleum. It does not seem that the cost of the wax and the trouble which may be experienced in its use would warrant any increased lubricating qualities that might be derived.

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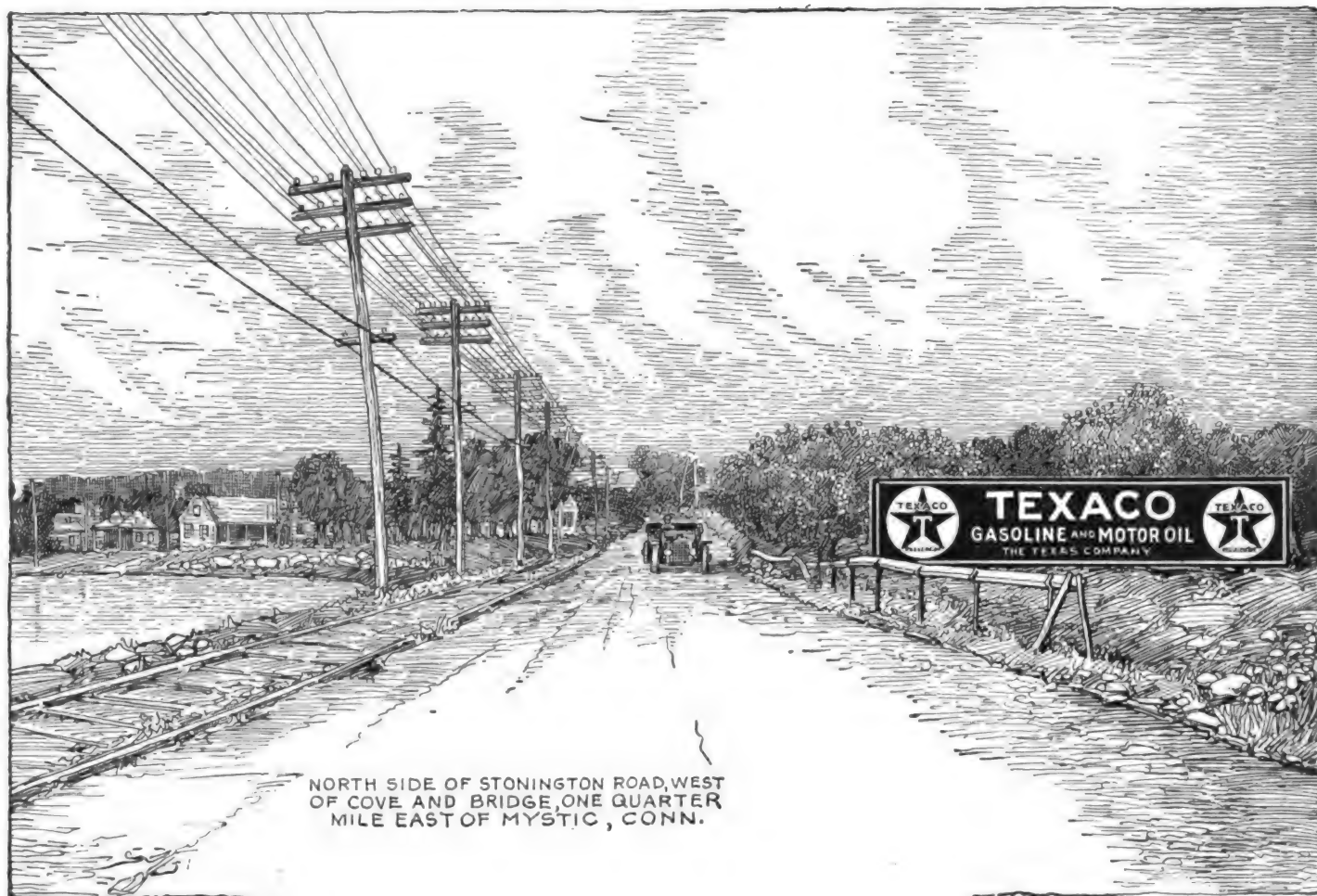

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CARBURETOR ADJUSTMENT.

While it is true that the physical laws involved in the problem of carburetion are somewhat complicated and difficult of solution, these are for the designer and manufacturer to study and do not concern the motorist.

The carburetor performs two functions. It acts as a calibrating or measuring device, releasing a proportionate amount of fuel to the air which passes through it. In this sense it is an automatic valve. Secondly, it acts as a mixing device, reducing the liquid fuel to a finely divided spray, or mist, in order that it may become intimately mixed with the air preparatory to combustion. This phase of its operation cannot be improved upon after the device is installed and it is only for the purpose of regulating the proportion of fuel to air that adjustments are made.

Nearly all carburetor manufacturers give practical directions in their catalogues or instruction books, describing how the adjustments are made but, for some reason, users seem to have availed themselves of these to a very slight extent. For the guidance of those who wish to obtain the maximum power (and mileage) from a given quantity of gasoline, improve their acceleration (pick up), get more speed, and keep their engines clean and free from carbon, it is hoped that the following brief hints will be of assistance.

In the first place, never attempt an adjustment unless the motor has been running for some time and is well warmed up. It is for this reason that adjustments made in the garage, before starting out, are found to be unsatisfactory after the car has been on the road for a short time. Secondly, bear in mind that it is practically impossible to get a proper adjustment with the engine running idle, or without load, as this is not a normal condition. It is, of course, somewhat difficult to have the engine running under load with the car standing, but this condition may be brought about in several ways.

Loosen the high tension terminals on the plugs of all but one cylinder. After starting motor, assuming that it has

already been warmed up, remove all of these terminals, placing them against some part of the motor so that they are "grounded." As this is done it will be found necessary to open the throttle somewhat, as only one cylinder will be working, and this will be carrying a fairly heavy load, as it not only has to overcome the internal friction of the engine but is driving the generator, fan, water pump and magneto. The load may be still further increased by jacking up the rear wheels, engaging the high speed gears, and setting the hand brake until the engine is "laboring" appreciably, taking care to chock the front wheels. With the hand throttle wide open, the high speed adjustment may now be made, the idea being to have the mixture as weak as possible, consistent with regular firing and maximum speed, the procedure being to gradually increase the air, or reduce the fuel by turning the needle valve (depending on the type) until the cylinder begins to miss fire, then turning back just enough to get good, snappy results.

If there is an intermediate adjustment this may be regulated in the same way, but with the hand throttle set about one quarter open. Except for racing, this latter condition is the one which is most nearly approximated in ordinary road travelling. It now only remains to check the adjustment by a road test, which may be best done by setting the car against a good stiff hill. If, with wide open throttle, there is any tendency to back fire the mixture may be made slightly richer, but the change should be very slight.

When set in this manner it may be found that the engine is cold and not very responsive when first started, and rather than open the gasoline adjustment to overcome this temporary condition, it is better to make use of the choking device, with which most carburetors are now fitted, until the motor becomes warm.

While practically every motorist is now strenuously complaining of the high cost of gasoline it is apparent, from the smoky and evil smelling exhaust emitted from a large percentage of the cars on the road, that at least a partial remedy for the operating expense lays in the hands of the users.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

FREE ROAD MAPS

Check maps desired and mail to



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MAGNETOS

are so good that racing drivers won't have any other system of ignition—they, like experienced owners, know that no other system of ignition is as reliable, as fast, or as efficient.

Be Satisfied. Specify Bosch.
Correspondence Invited.

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Briscoe Twenty-four, \$625, electric starting and lighting; full equipment.
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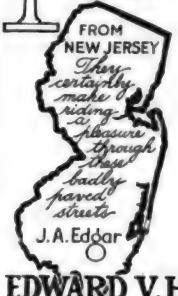
BRISCOE MOTOR CORPORATION, 157 Leroy Ave., Jackson, Mich.

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"ALL PURPOSE" FOUR AND SIX

FOUR AT \$2,000 (Size \$250 Extra)
THE PEERLESS MOTOR CAR CO., CLEVELAND, OHIO
Makers also of the "48-Six" and Peerless Trucks.
Licensed under The Kardo Patents.

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*Hartford



Makes every Road a Boulevard

SHOCK ABSORBER

EDWARD V. HARTFORD Inc. 147 MORGAN ST. JERSEY CITY, N.J.



WHY USE INFERIOR PLUGS WHEN CENTERFIRE

can be bought at the same price? They overcome all Engine troubles, fire where others fail and Add Power to engine. Any length point desired made to order. Try them and you will use them always. Make a trial and save money. \$1.00 each, 6 for \$5.00.

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WHY FREEZE YOURSELF RUIN YOUR AUTO ?

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SAFE GARAGE HEATER

Burns Natural or Artificial Gas
Needs Be Lit but Once a Year—Pilot Light
No Gas or Fumes Can Enter Heater

SUPERIOR MFG. COMPANY
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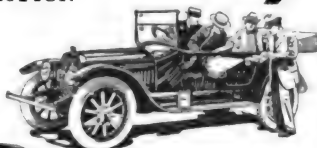
WONDER-MIST

Cleans and polishes in one operation without hard rubbing and cannot injure finish as soap and water does.

You spray it on—right over mud, grime and road tar—easiest and quickest, most economical way. Ask your dealer for **FREE DEMONSTRATION** or write us for particulars.

The Wonder-Mist Co.

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Owner-Proved Value

Every Inter-State has proved its value definitely and conclusively in the hands of owners.

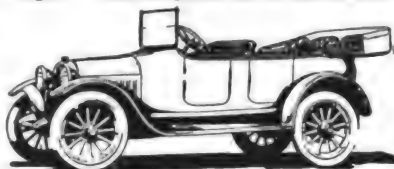
If you want to know about **proved value** and **actual assets** for either the man who buys or sells cars, write to-day.

Powerful, high speed, long stroke valve-in-head motor. Beautiful streamline body, seating five passengers comfortably. Two unit Remy electric Starting. Light

ing and Ignition. Over-size tires—both front and rear. Aluminum running boards. Heavily braced crown fenders. The most accessible medium priced car on the market.

Touring Car - - \$850
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MOTOR CO.**
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Why Pay Excessive Hotel Rates?

THE NEW AMSTERDAM

Euclid Avenue at 22nd Street, CLEVELAND, OHIO

A five minutes walk from the active centres, yet overlooking the most beautiful residence section of Cleveland.

"The logical resting place for tired Tourists."

Large airy suites of from two to five rooms (also single rooms).

GARAGE NEARBY

RATES:—\$1.50 per day, each person
Dining Room Modified a la Carte

A. A. McCASLIN, Managing Director. L. McNAMARA, Manager.



S. J. R.
BOULEVARD ROADSTER
\$955

Four Cylinder Motor, 3 1-8 x 4 1-2, en bloc
Cantilever Springs, 110" Wheelbase
Hook Wire Wheels

DEALERS: WRITE FOR OUR PROPOSITION

S. J. R. MOTOR COMPANY

126 Massachusetts Ave.

Boston, Mass.

SUBSTITUTES FOR PLATINUM.

(B. I. L., Bristol, R. I.)

Is there any metal which may be used as a substitute for platinum for contact points of a magneto? The points of my magneto have very short life and the new platinum rivets I have bought are rather expensive and do not seem to be particularly good, judging by the short time they last.

Platinum, or a platinum-iridium alloy, is used for the contact points of magneto interrupters and coil vibrators for several reasons. The function of the interrupter is a very important one and, when study is given to the mechanical means employed to produce the countless operations of closing and opening the primary circuit, it will be readily understood that durability must be a paramount consideration in its construction.

The conditions call for a metal which must be hard enough to withstand wear; which must have high conductivity, to insure quick electrical connection of minimum resistance; which must be non-corrosive and free from tendency to oxidize, so that surfaces will remain clean and bright under various conditions of moisture and temperature; and which must have a high melting point to withstand the heat of the electric arc to which it is subjected.

Platinum is the metal which best satisfies the requirements and although expensive (costing more than gold at the present time), it is the cheapest thing to use, owing to its durability. An alloy in which nickel forms a considerable percentage because it has high conductivity and hardness and is, of the baser metals, best adapted to the purpose, has been used, but its utility is in no way comparable to that of platinum. Next to the latter a gold and iridium alloy would be most serviceable.

The next time you purchase rivets submit them to a jeweler, who can readily tell, by testing with nitric acid, whether they are platinum or a cheap imitation. If the rivets are all right, and you still have trouble, it is evident that something is wrong with your condenser, and it would be well to send the magneto to the maker or nearest service station.

OILING CLUTCH LEATHER.

While a great many owners and drivers consistently treat their clutch leather to a periodical dose of castor or neats foot oil, the method in which this is usually done frequently makes the job abortive of any permanent results, except that these sticky oils serve to accumulate dust and grit around the flywheel and clutch parts. It seems to be the usual practice to have some one hold the clutch out for a few minutes so that a quantity of the oil can be dumped into the space between leather and flywheel from a can, or squirted in with an oil gun or oil can. The clutch is then slipped for a few seconds "to spread the oil" (which it certainly does) and the car is then ready for business. While this treatment might produce some temporary benefit, it is a clumsy, wasteful and dirty method. The proper purpose of applying oil to the leather is to soften it, prolong its life and overcome its tendency to glaze over, so that it will take hold smoothly and not slip unduly. If the oil is applied only to immediately rub off again, the very object aimed at is defeated.

The proper way to treat the clutch leather is to give the oil a chance to soak in, and to do this it is well to provide some means of holding the clutch cone away from the flywheel. This is conveniently done by cutting a stick of wood to such a length that it will be accommodated between the front of driver's seat and the clutch pedal, when the latter is depressed to the fullest extent. The stick will be held in place by pressure of clutch spring. The oil should now be applied by spreading it evenly over the surface of leather, using a stiff feather, hack saw blade, or thin blade of wood for this purpose. Do this when it is possible to let the car stand for several hours, such as over night, leaving the stick against the pedal. On some cars this treatment will be found to work wonderful improvement.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

Automobile Springs Are Designed to Meet the Requirements of a Maximum Load



Thus it is that a seven-passenger car rides best with seven passengers and a five-passenger best with five. When the load is less than capacity, the car, lacking the weight necessary to hold it down and steady it, "kicks up," even though the road be smooth.

Yet how seldom either of these two kinds

of car carries a full load!

Again, many a roadster, of but two-passenger capacity, has seven or five-passenger chassis and springs and is bound to "kick up" and bounce because its load is always too light to hold it down and steady it.

In these and other instances the

Hartford SHOCK ABSORBER

affords the requisite control over spring action to prevent the "kick up," to keep the wheels from bouncing, to so materially improve the riding qualities of a car that those who ride in it are impressed by the fact that the HARTFORD is the one



Automobile Manufacturers are now using the finest springs that can be made. If you want more comfort, you must use Hartford Shock Absorbers.

shock absorber that really

**Makes Every Road
a Boulevard**

Whether you ride light or heavy and wherever you ride, comfort will attend you if your car is Hartford-equipped.

Try a set thoroughly. Satisfaction or money back.

EDWARD V. HARTFORD, Inc.

Heretofore Known as Hartford Suspension Co.
147 Morgan St., Jersey City, N. J.

Makers of the Hartford Shock Absorber, Hartford Cushion Spring, E. V. Hartford Electric Brake, Hartford Auto Jack, Hartford Bump Absorber, Red Back Jack.

Branches: New York, 1846 Broadway and 212-214 W. 88th St.; Boston, 319-325 Columbus Ave.; Chicago, 2637 Michigan Ave.

Distributors in principal cities. Dealers everywhere.

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EAGLEINE OILS
are unequalled for motor lubrication, freer from carbon, economical because they protect the motor against mechanical wear, and the quantity required is comparatively small.

These are the claims of thousands of motorists,—some with years of experience,—who want full value, and more who know the value of high grade lubricants, and who know when they obtain satisfaction.

EAGLEINE QUALITY IS INSURED TO YOU

A grade for every type of motor.

It is sold in sealed containers

Let us send you our new book and chart. It is free at request.

EAGLE OIL AND SUPPLY CO.

44-45-46 India St., Boston, Mass.

NEW YORK CITY
Woolworth Bldg.

CHICAGO
1132 W. 37th St.

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A WONDERFUL IMPROVEMENT IN "IDEAL" DOUBLE TREAD TIRES GUARANTEED AND ADJUSTED ON A 4000 MILE BASIS.

These Tires are so constructed so there will be ABSOLUTELY NO DANGER TO YOUR INNER TUBE.

		New Tubes			New Tubes
28x3	\$4.75	\$1.85	35x4	9.85	2.95
30x3	5.25	1.85	36x4	10.50	3.00
30x3 1/4	6.50	2.05	34x4 1/4	10.05	2.65
31x3 1/4	6.80	2.40	35x4 1/4	9.50	2.65
32x3 1/4	7.25	1.80	36x4 1/4	11.75	3.70
34x3 1/4	8.00	2.15	37x4 1/4	12.20	3.80
31x4	8.25	2.65	35x5	12.65	4.35
32x4	8.75	2.75	36x5	13.00	4.40
33x4	9.20	2.80	37x5	13.45	4.50
34x4	9.50	2.85	37x5 1/4	13.60	4.60

PUNCTURES AND BLOW-OUTS ALMOST ENTIRELY ELIMINATED WHEN USING THESE TIRES.

One dollar or deposit sufficient to defray express charges required with each order. Shipments sent promptly C. O. D. subject to your inspection.

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Chicago, Ill.

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ALL FRESH SELECTED STOCK—STANDARD MAKES

Size	New Tubes	New Tubes	Size	New Tubes	New Tubes
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30x3 1/4	8.00	2.25	34x4 1/4	16.25	4.00
31x3 1/4	8.50	2.50	35x4 1/4	17.00	4.15
32x3 1/4	9.00	2.50	36x4 1/4	17.50	4.35
34x3 1/4	9.50	2.55	37x4 1/4	18.00	4.35
36x3 1/4	10.75	2.75	35x5	17.50	5.00
31x4	11.75	2.90	36x5	18.50	5.00
32x4	12.50	3.20	37x5	20.00	5.20
33x4	12.75	3.25	Add 10% to the above prices for non-skid.		
34x4	13.25	3.35			

Special Bargains in Slightly Used and Demonstrating Tires

Size	Used Tubes	Used Tubes	Size	Used Tubes	New Tubes
30x3	\$3.50	\$1.35	35x4	7.50	1.75
30x3 1/4	4.25	1.45	36x4	7.50	1.75
31x3 1/4	4.50	1.50	34x4 1/4	8.00	1.75
32x3 1/4	5.25	1.60	35x4 1/4	8.00	1.80
34x3 1/4	5.50	1.60	36x4 1/4	8.25	1.85
31x4	6.25	1.65	37x4 1/4	9.50	1.90
32x4	7.00	1.60	35x5	8.50	2.00
33x4	7.25	1.70	36x5	9.50	2.00
34x4	7.75	1.70	37x5	9.75	2.20

We guarantee all tires sold by us at the above prices to be free from imperfections in material and workmanship. Send one dollar deposit with each tire ordered. Tires will be sent promptly C. O. D. with privilege of examination. Specify style of rim to avoid delay.

TIRE REPAIR AND SUPPLY CO. Dept. ■ 1463 Michigan Ave., Chicago, Ill.

*This Same
Stamina
in All Models
of the
STURDY
STUTZ*

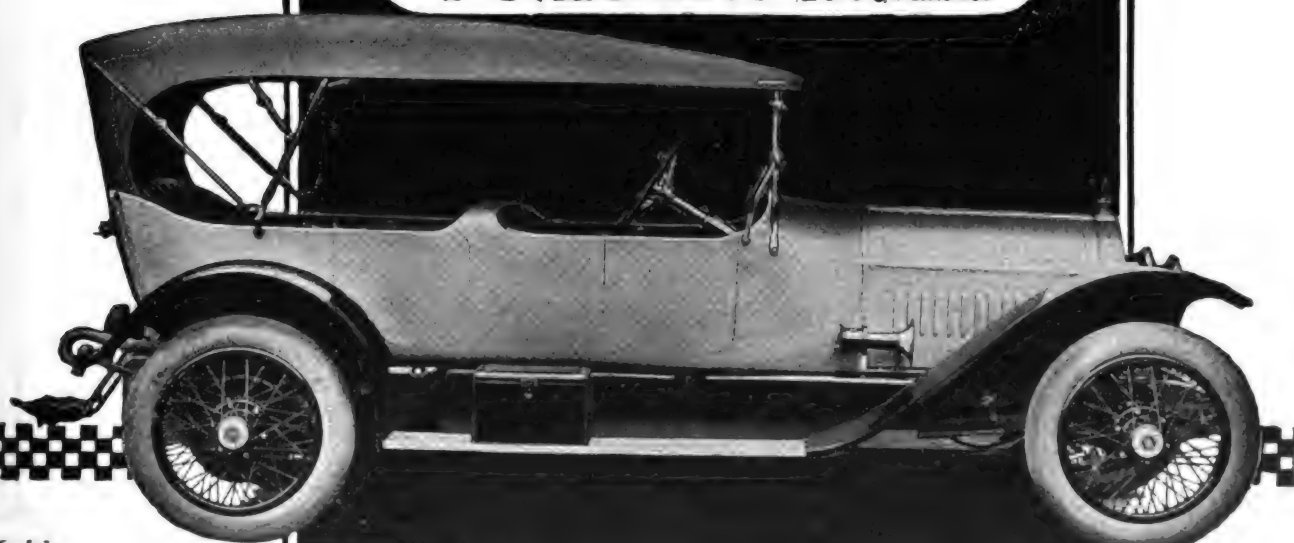


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Speedway Champion

WORLD'S
Road Race Champion

World's Long Distance
Records 250; 300; 350 mi.

World's Record for Consistency
4 Consecutive 1st & 2nds



Three Models
\$2275 and \$2550
Literature on request

STUTZ MOTOR CAR CO.

Indianapolis

Indiana

AUGUST 25, 1916.

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How often have you heard the repairman, machinist or shop manager say, "It's the same old Coes, just as good as the day I bought it—it will last forever."

That is evidence of the quality that has made Coes wrenches the standard the world over.

Coes Wrenches made today are just as good as the Coes Wrenches produced 50 years ago.

The material is selected with the same care, made by equally experienced and trained wrench makers, in a factory which specializes in wrench making. The wrenches are finished carefully and many times tested to assure the quality that will meet every requirement placed upon them.

Car owners who know wrench values demand the Coes. It is most popular with automobile repairmen, and in every other line of mechanical work Coes Wrenches will be found on the benches and in the tool kits of the expert workmen.

Coes wrenches can be had in just the size to fit any use. Any Coes will afford the same long and satisfactory service. It is always dependable and from the standpoint of wrench service it is the cheapest wrench produced.

Coes wrenches are sold wherever motor cars are used. They may be had of all jobbers, automobile supply houses, and automobile and hardware dealers.

Catalogue on request.



Coes Wrench Company, Worcester, Mass.



(When Writing to Advertisers, Please Mention The Automobile Journal.)

AUGUST 25, 1916.

REO

- ¶ If you'll go over in your mind the list of those automobile dealers throughout the country who have made money consistently, you will find that a very large percentage of them are those who have handled the Reo line of automobiles and motor trucks for several years.
- ¶ And those among them who have prospered most, and who today as business men stand for most in their respective communities, have handled Reo cars exclusively.
- ¶ The inference is, an exclusive representation of the Reo line spells financial success as well as reputation for the distributor.

REO MOTOR CAR COMPANY
LANSING, MICHIGAN

NEW YORK

CHICAGO

CLEVELAND

BOSTON

DETROIT

Subscriptions:

The United States and Mexico, \$1.50 a year;
Canada, \$2.50 a year.
Foreign Countries in Postal Union, \$3.50 a year.

AUTOMOBILE JOURNAL

Remittances:

Should be made by Check, Draft, Postoffice or Express Money Order, or Registered Letter. Money enclosures must be at sender's risk.

Entered as second class matter, April 15, 1906, at the Postoffice at Pawtucket, R. I., under Act of Congress of March 3, 1879

Ten Cents
a Copy

VOL. XLII.

AUG. 25, 1916.

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Treasurer - - WILLIAM H. BLACK
Secretary - - - D. O. BLACK, JR.

Published the 10th and 25th of each month by the

AUTOMOBILE JOURNAL PUB. CO.,
Times Building, Pawtucket, R. I.

IN THIS issue appears a very interesting description and a complete itinerary of a motor car tour through the picturesque and historic sections of Pennsylvania, Maryland and West Virginia, the route following for a large part of its course the Old National Trail. Robert Bruce, in his book entitled "The National Road," describes and illustrates this section very thoroughly, covering both its historical and economic foundations. It is a book that will be appreciated by everyone. It sells at the nominal price of \$1. Mr. Bruce's address is Clinton, Oneida County, New York.

A SPECIAL feature of the next issue will be a story of the national convention of the Fire Department of the United States, which begins Aug. 29 at Providence, R. I. Fire fighting equipment is to be tested out, and the description of the motorized apparatus will furnish the readers with much interesting and educational information. A very complete mechanical description of the apparatus will appear in the September number of Motor Truck.

NATIONAL Touring Week served to demonstrate that a great number of motor car owners appreciate the joys and benefits of long distance tours. The large volume of inquiries received by the Touring Editor bears out this conclusion, and also shows that the majority are learning that their own states possess scenic and historic lures that are in many cases equal to those of distant commonwealths. Whether a subscriber contemplates a trip near at home or to some distant destination, the Touring Editor is prepared to lay out the route, plan the night stops. This service is free to subscribers to The Automobile Journal.

WHILE the Majority of new cars are supplied with all the equipment necessary to operation, the manufacturers of accessories and special equipment are producing devices that make it possible to obtain a greater measure of pleasure from motoring. No better place to view the wares of these manufacturers exists than in the editorial and advertising columns of The Automobile Journal. Complete information—an editorial analysis of each of the latest and best articles on the market, the price and the name and address of the maker—is given in each issue.

A FREQUENT subject of much correspondence with the Publisher is that the writer has been unable to obtain copies of the magazine at news stands. This is regrettable, but is easily rectified by registering a subscription with the publication office, which will insure each copy being sent direct by mail. When sending subscriptions be sure to write legibly and specify the street and house number.

CAR Owners Are Demanding with increasing insistence full mechanical details of motor vehicles and their components and accessories. It is not idle curiosity, but has to do with the practical application of the knowledge to the maintenance and operation of their cars. This knowledge can be obtained from The Automobile Journal's complete library of automobile mechanics, containing more than 1000 pages and 2000 illustrations and covering every subject relating to care, repair and operation. The scope of the books is shown by the following titles: Engine, Magneto, Battery, Carburetor, Tires, Chassis, Lighting, Overhauling, Operation, Motorcycle and Truck Operation.

AUGUST 25, 1916.



A handsome spark plug case **Free**
and a spark plug wrench . .
With four spark plugs that \$4
will outlast your engine . .



Mail us a \$4 check or money order for four Splitdorf Spark Plugs (the plug with the Green Hex Jacket). We will forward you the plugs, carriage prepaid, and with them we will send you, free, a highly polished spark plug case and a spark plug wrench, complete with detachable handle. The case is handsomely finished, and fitted with recesses for four plugs. Keeps your "extras" handy and compact. The wrench is one of the most convenient tools you can have. With it you can take out a plug for inspection in a second.



These plugs are practically indestructible, positively gas and oil tight. They are as nearly soot-proof as a plug can be. Dozens of times they have run 20,000 to 30,000 miles without ever having been cleaned.

Made in all sizes and in types to suit every car, motor cycle motor truck, motor boat, aeroplane, tractor and stationary gasoline engine. Write for Splitdorf Directory which tells which plug to use in **your** engine.

When ordering, be sure to state size desired or name of engine.

SPLITDORF ELECTRICAL CO., Newark, N.J.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

AUGUST 25, 1916.

Motor Triumphs Made with

61
Cars
Now
AC
Equip-
ped

AC Spark Plugs

WHEN Baker in a Cadillac Stock Roadster made that thrilling dash from Los Angeles to New York in May last—covering the 3371 miles in the remarkable time of 7 days, 11 hours and 52 minutes—his car was equipped, as are all stock Cadillacs, with AC Titan Spark Plugs. In the Hudson

performances in the 24-hour race and in the one-mile dash, AC plugs played an important part. The Cadillac flight from coast to coast stands out as a most remarkable test of endurance and dependability for the car and for the AC Plugs, the standard Cadillac equipment.

The list of AC users is growing.

These cars name AC Spark Plugs as standard equipment—

Extract from Cadillac Advertisement Which Appeared in the June 17th Issue of the Saturday Evening Post:

"Consider, now, the almost miraculous endurance of the car, handicapped a hundred times over in the matter of road-bed, yet it traveled its distance *without so much attention to its motor as the cleaning of a spark plug.*"

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Jordan
Liberty

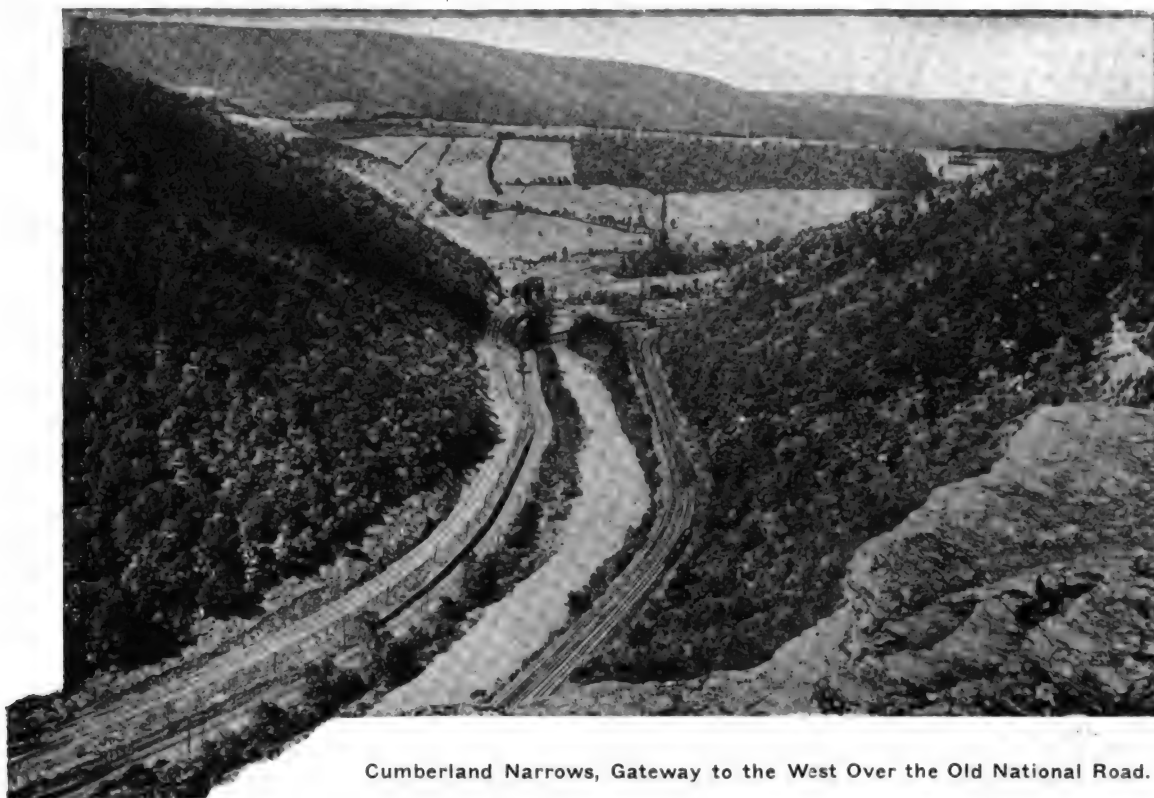
Champion Ignition Co., Flint, Mich.



(When Writing to Advertisers, Please Mention The Automobile Journal.)

AUGUST 25, 1916.

AUTOMOBILE JOURNAL



Cumberland Narrows, Gateway to the West Over the Old National Road.

Touring Through Historic Pennsylvania, Maryland and West Virginia.

THERE is nothing that will fix the great historic events in our country's history so vividly in the minds or stimulate into active existence a strong patriotic sentiment as a visit to the scenes of these epochal happenings through which it might be said our country not only had its birth, but also maintained its existence. First in the Revolutionary War and again during the Civil War the United States experienced the crises of their existence and the majority of the important events that characterized these two periods took place in the territory lying south of New York City, between the Atlantic seaboard and the Ohio river and north of Washington.

This section is the richest in historic interest of any in the country and the automobile owner who can find a week or 10 days to spare in touring, will be amply repaid for his time if it is spent among these spots that will be pre-eminent forever in our history. The section is also beautiful in scenery, being drained by the Delaware, Susquehanna, Potomac and Ohio rivers, all of which

were prominently identified with the military manoeuvres in both wars. The Alleghenies also run through the centre of the region and supply mountainous scenery of exceptional beauty.

An additional feature to a tour in this section is that the roads are not only well laid out and in good condition, but are of national importance. The National road, which is the eastern link of the National Old Trails Ocean to Ocean Highway, over which the route lays from Philadelphia to Wheeling, W. Va., is the oldest and most historic thoroughfare in the United States, while the Lincoln Highway, over which the return trip is made into New York, is the newest highway of national importance.

Details of the Trip.

The accompanying itinerary gives the route of a tour from New York City through Philadelphia, Baltimore, Washington, to Wheeling; North to Pittsburg, returning eastward over the Lincoln highway to Philadelphia. The cities, towns and villages are close together throughout the route, affording excellent

accommodations for the motorist, who, if well posted on the history of the United States, will feel urged to remain a day or more in many of the stopping places, as they not only savor of the times when history was in the making, but teem with lively interest in the present.

From New York to Philadelphia the Lincoln Highway is followed both going out and on the return trip. The route runs through New Brunswick, Princeton, Trenton and Camden, over excellent highways. At Philadelphia the route turns southward, running along the Delaware river to Wilmington, thence through Elkton across the Susquehanna river to Bel Air, which is about 25 miles out of Baltimore.

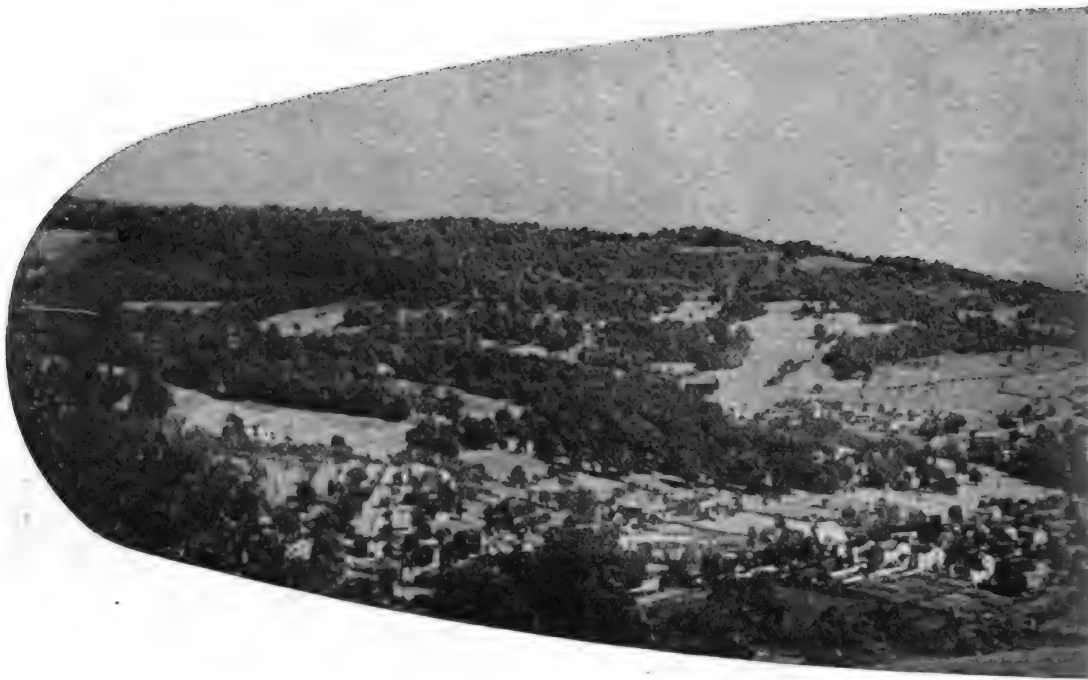
From Baltimore to Washington, a distance of about 39 miles, the route is over the road once known as the "Washington Road," which was traveled by the stage coaches in the colonial days. Beyond Beltsville the Maryland agricultural station and the government aviation grounds are passed and a number of ex-

cellent examples of colonial architecture in old residences are seen. Bladensburg, the oldest settlement in Maryland, was the scene of the battle of Bladensburg, in 1814, when General Ross, commanding the English troops, defeated the American forces and gained entrance to the national capital.

The tourist upon entering Washington will find so much of interest that he will be tempted to stay over the allotted time. A full week might be spent in inspecting the various government buildings and institutions. A ride around the principal avenues in the section of the Capitol and White House before leaving will suffice to give one a good idea of the layout of the city and the magnificent specimens of architecture.

Through Maryland.

If the weather is fair the morning drive out to Frederick, Md., is entrancing, passing out Wisconsin avenue among beautiful buildings and estates with well kept grounds. One place of particular interest to every motorist is the section of the road from the District of Columbia boundary line to Rockville, which is maintained by the government as an experimental highway for determining the qualities of different kinds of surfacing. The different kinds of materials used in



A Typical Mountain Village, Eckhart, Md.,

Frederick. In crossing over Carroll's creek an inscription will be noticed on the bridge marking the spot where, legend says, Barbara Fritchie lived, the character that Whittier made famous in his poem of that name.

On the road from Frederick to Braddock Heights the mountains come into view for the first time and very soon the ascent of Catoctin mountain begins. In less than two miles the road rises about 460 feet between Braddock Village and Braddock Heights. From the latter elevation a beautiful view of all the surrounding country may be obtained, particularly South Mountain battlefields and the War Correspondents memorial arch.

An Historic Locality.

In Middletown, the next closely built up place, is the old home of Commodore Gelsinger, who fought naval battles with the pirates at Tripoli and Algiers. Beyond this point the road rises precipitately again. Beyond the stone Catholic church on South Mountain, which is reached through Turner's Gap, there are a number of memorial tablets, on which a description is given of the movements of the opposing armies across the mountain. The largest and most important battles of the Civil War were fought almost within view of this mountain and it figured prominently in the military operations. It was here that Rutherford B. Hayes, who afterward became President of the United States, was wounded, and where William McKinley, who also became President, was first promoted.

Between South Mountain and Hagerstown, beyond Boonsboro, there is a short cut to Sharpsburg, from which place the Antietam battlefield may be reached. Hagerstown is the centre of a number of trunk highways extending North, South, East and West. Antietam is 11 miles south of the city and Gettysburg, 35 miles northward. The road going out toward Cumberland ascends a grade

coming in view of Conococheague creek, which winds around in the valley with short turns. A view may also be obtained from here of the mountains in the distance, which appear so formidable that the tourist doubts whether it is possible to ascend them.

From the top of Fairview Mountain into Baltimore and Indian Springs the road lies through a comparatively wild section. Beyond the latter place it runs along the Chesapeake & Ohio canal and Potomac river for a distance of 10 miles to Hancock, where it turns northward across the mountains. The country between these two points becomes a beautiful panorama of exquisite scenery to the rapidly moving tourists. Long and deep valleys stretch out to the horizon and mountain ridges and peaks close in the range of vision at times to an extent that one gains the impression of riding about in a huge pit.

The intervening distance, about 40 miles to Cumberland, is the most pic-



National Pike in the Cumberland Narrows, the Road Running on a Shelf. Photograph by Gilbert, Frostburg, Md.

the various sections are designated by signs placed along the roadway.

Between Urbana and the Monocacy river is the battlefield of the Monocacy, where General Lee Wallace and his command were defeated by the Confederate soldiers under General Jubal Early in 1864.

Frederick, Md., was one of the main strategic points in the war for freedom, and during the Civil War was occupied by the Confederate soldiers. Thomas Johnson, the first state governor of Maryland, who nominated George Washington as commander of the American armies, had his summer home on Rose Hill, which lies on the outskirts of the city. A stone freight house of the Baltimore & Ohio railroad, said to be the oldest in the world, is also located in



Detail Map of a Motor Journey Through
AUGUST 25, 1916.



a Number of Which Are Passed on the Tour.

turesque part of the entire trip. While the road winds around like a path in a maze and goes up and down the most precipitous grades of any well traveled thoroughfare in the country, it is easily followed. Out of Hancock the route leads up and over Tonoloway ridge, and further on over Sideling hill, where there is an ascent of 760 feet in a mile and a half. Down the other side of this range there is a descent of 495 feet in one mile.

The roads through this section are curved and contain many short turns, consequently, the motorist should drive very carefully, as while no danger exists to the machine that is under control, fast or reckless driving would be very foolish. Before the ascent of Town Hill, which is the next peak to be negotiated, some of the most beautiful scenic effects of the entire trip through the mountains become visible. The environment seems quiet and peaceful, as there is little evidence of habitation in view and one can see great distances into the mountains

and across valleys and low plains. Coming down the west slope of Green Ridge, which is the next high elevation on the road, one of the largest cultivated apple orchards in the United States comes into view. There are nearly 50,000 trees in this orchard. Descending into the valley of Fifteen Mile creek, Polish mountain looms in the distance, across a great ravine, extending as far as the eye can see to the North and South.

Climbing Martin Mountain.

Passing on through Gilpin and into Flintstone, there is a hotel 108 years old, formerly known as the "Piper House," which looks little the worse for the wear of the elements. A few miles out of Flintstone the ascent of Martin mountain begins, during which a rise of 535 feet in a little over a mile is made to the summit, 1720 feet above sea level. Down the west slope the road leads through the valley into Cumberland on the Potomac river, the centre of transportation of that section. This city is about half way between Washington and Wheeling and is a convenient stopping place on the third night out, as it affords good hotel accommodations.

From Cumberland to Wheeling the distance is about the same as that traveled on the previous day and the route leads through the section which became prominent historically during the French and Indian war. This section was entirely constructed at the expense of the government. As far as Uniontown, which is half way to Wheeling, the road continues through the mountainous country, attaining much higher altitudes, however, the elevation at the summit of Big Savage mountain being 2880 feet and at Meadow mountain 2792 feet. A few miles out of Farmington, close by the road, is the site of "Fort Necessity," where during the French and Indian war George Washington was forced to surrender his command.

The remainder of the road into Uniontown is through a heavily wooded section. There are many old taverns in this quaint town and it also contains many land marks nearly a century old. Twelve miles from Uniontown is Brownsville, on the Monongahela river, and 15 miles further on, Washington, which is the nearest point on the National road to Pittsburgh.

Into the Ohio Valley.

The route from Washington to Wheeling is mostly down hill and crosses the panhandle of West Virginia into the valley of the Ohio river. West of this point lays the great level farming lands and prairies that the pioneers of over 100 years ago sought after traveling over the National road to the Ohio river, and there is today an enormous amount of travel East and West through the city; more, probably, than through any other city of its size in the United States.

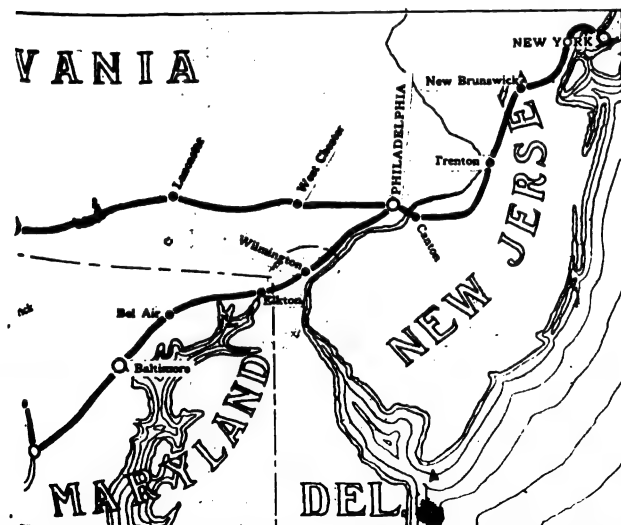
A return trip is made to Washington, Penn., where there is a branch road leading northward connecting the National Old Trails Ocean to Ocean Highway with the Lincoln Highway at Pittsburgh. This road, which is a little less than 30 miles, passes through Cannonsburg, Bridgeville and Carnegie. Pittsburgh is the leading centre of the steel industry of the



Chesapeake and Ohio Canal, One of the Most Picturesque Artificial Waterways in the United States.

United States and is a veritable hive of industry. The trip back East from this point is over all macadam roadways, constituting the eastern section of the Lincoln Highway. Going in a southeasterly direction out of Pittsburgh the Lincoln Highway runs along the southern border of Pennsylvania into Philadelphia, passing through numerous industrial towns and cities and places where some of the prominent battles of the Civil War were fought.

Gettysburg is the best known sight-seeing point and thousands of tourists stop there every month to ride over the battlefield where one of the greatest battles in the world was fought and where the decisive blow in the Civil War was struck. The tourist may obtain a guide



an Historic Section of the United States.
AUGUST 25, 1916.

here for a trip of 25 odd miles about the battlefield, he explaining in detail the battle formation of the two armies and bringing back in graphic detail the terrific struggle that ensued there for three days. With an experienced guide this feature is worth the entire trip.

Lancaster, the next large city out of Gettysburg, is rich in historic lore, being the oldest inland city corporation in the United States. There is an old Lutheran church, built in 1766, in which services are still held. The city is also a great beef centre, having the largest stockyards east of Chicago.

Under the name of "The National Road," a booklet of 100 pages' Robert Bruce of Clinton, N. Y., has described the 300 miles of road running from Baltimore or Washington to Wheeling, W. Va., the route which forms part of the itinerary of this tour.

Mr. Bruce's book, which is beautifully illustrated and contains a topographical map of the route, gives detailed descriptions of all the interesting places along the National Road, showing their historic relation to the Revolutionary, Civil and French and Indian wars. The illustrations used in this article are from photographs loaned by Mr. Bruce.

New York-Philadelphia.

New York.....	00	Monmouth Jet.	46.8
Jersey City.....	6.3	Trenton.....	63.4
Newark.....	12.2	Oxford Valley.	70.0
Elizabeth.....	18.0	Hulmeville.....	73.6
Rahway.....	23.1	Andalusia.....	78.9
Iselin.....	27.4	Torrendale.....	81.1
Metuchen.....	31.4	Holmesburg.....	83.4
New Brunswick	36.0	Philadelphia.....	95.6

Philadelphia-Washington.

Philadelphia.....	0.0	Perryville.....	60.9
Darby.....	6.3	Webster.....	66.0
Glendolen.....	8.2	Churchville.....	70.5
Norwood.....	9.3	Belair.....	76.3
Eddystone.....	12.5	Kingville.....	83.5
Chester.....	13.6	Carney.....	89.7
Marcus Hook.....	18.5	Baltimore.....	100.4
Claymont.....	20.1	Elkridge.....	109.4
Holly Oak.....	21.2	Laurel.....	121.4
Wilmington.....	26.4	Contee.....	123.4
Elsmere Jet.....	29.5	Beltville.....	126.9
Marshalltown.....	32.0	Hyattsville.....	133.4
Newark.....	40.0	Bladensburg.....	133.9
Elkton, Md.....	46.6	Washington.....	139.4

Washington-Cumberland.

Washington.....	0.0	Benevola.....	62.7
Bethesda.....	7.4	Hagerstown.....	70.7
Rockville.....	15.3	Hancock.....	97.7
Galtherburg.....	20.5	Bellegrove.....	110.7
Clarksburg.....	28.5	Piney Grove.....	114.7
Hyattstown.....	32.4	Pratt.....	122.7
Frederick.....	43.7	Glipen.....	125.7
Middletown.....	51.7	Flintstone.....	126.7
Boonsboro.....	59.7	Cumberland.....	139.7

Cumberland-Wheeling.

Cumberland.....	0.0	Summit.....	56.0
Frostburg.....	11.0	Uniontown.....	62.0
Grantville.....	25.0	Brownsville.....	74.0
Keyser Ridge.....	31.0	Scenery Hill.....	86.0
Addison.....	36.0	Washington.....	99.0
Somerfield.....	40.0	Claysville.....	109.0
Farmington.....	50.0	Wheeling.....	132.0

Wheeling-Pittsburg.

Wheeling.....	0.0	Morgans.....	43.2
Claysville.....	23.0	Bridgeville.....	50.8
Washington.....	33.0	Carnegie.....	54.8
Cannonsburg.....	41.2	Pittsburg.....	62.1

Pittsburg-Bedford.

Pittsburg.....	0.0	Youngstown.....	42.5
Wilkinsburg.....	7.3	Ligonier.....	51.6
Wilmerding.....	14.0	Jenners.....	64.4
Circleville.....	21.3	Stoyestown.....	75.1
Irwin.....	23.1	Buckstown.....	77.1
Adamsburg.....	26.1	Shellsburg.....	90.6
Grapeville.....	28.4	Wolfburg.....	97.5
Greensburg.....	32.5	Bedford.....	100.0

Bedford-Gettysburg.

Bedford.....	0.0	St. Thomas.....	48.1
Mt. Dalls.....	6.7	Chambersburg.....	55.5
Everett.....	7.8	Fayetteville.....	61.0

Breeseewood.....	16.2	Cashtown.....	72.4
Harrisonville.....	27.6	Seven Stars.....	76.2
Fort London.....	42.1	Gettysburg.....	86.1

Gettysburg-Philadelphia.

Gettysburg.....	0.0	Downington.....	85.8
New Oxford.....	9.9	Whitford.....	89.1
Abbotstown.....	14.1	Malvern.....	93.5
Thomasville.....	21.8	Paoli.....	96.0
York.....	25.9	Dalesford.....	99.2
Wrightsville.....	40.7	Berwyn.....	106.4
Columbia.....	42.6	Devon.....	101.8
Lancaster.....	52.8	Wayne.....	103.3
Paradise.....	62.4	Ardmore.....	109.3
Strasburg.....	65.1	Philadelphia.....	118.7

The Doble Steam Motor Car. A Design Which May Prove Revolutionary.

If the Doble steam car, which is soon to be placed on the market, comes up to expectations, and there is every reason to believe it will, as it has been tested out for three years and driven over 30,000 miles, it will create quite a sensation in automobile circles.

Abner Doble of Detroit has always had strong faith in the idea that the steam propelled vehicle would be the ultimate car, despite the many drawbacks to this hope, found in the earlier models. There were features about the steam cars that made them undesirable and Mr. Doble started to work nine years ago to eliminate the objectionable points and create an engine for automobiles that would possess all the favorable features of steam, but without the undesirable ones that had made that type of power unpopular with motorists.

As a result of his labors Mr. Doble has a car which will perform some remarkable stunts. Turning on an ignition switch starts the car and its variable speed from a mile an hour up to 80 miles an hour is controlled through the throttle. The service brake is applied by

working a little lever on the steering wheel. The emergency brake handle is the only lever in the body of the car, the engine being reversed by a small pedal. It starts and gets away without sound or vibration and in appearance has nothing to indicate the kind of power plant used or its unusual character.

Kerosene is used as fuel, the car making about 14 miles to the gallon. By the use of a special condenser invented by Mr. Doble, the need of constantly replenishing the water supply, which was such a bad feature about the earlier machines, is eliminated, the water being used over and over again for a distance of 1300 miles. An improved oiling system is another excellent feature about the car, the oil being carried to the engine through the steam from the boiler. This not only provides for efficient and thorough lubrication in the engine and moving parts, but also spreads a thin scale of oil over the interior surface of the boiler tubes, preventing the formation of rust or scale.



Abner Doble, Inventor of the Doble Steam Car, Seated in the Fifth Vehicle He Has Made—Constructed in 1913, It Has Covered 33,000 Miles to Date.

AUGUST 25, 1916.

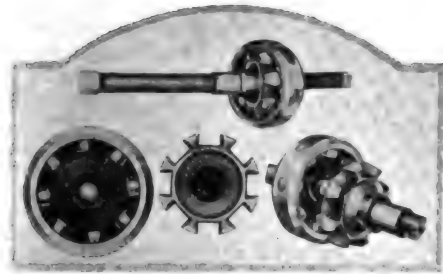
Laughlin Front Drive Automobile.

This Car Shows Several Radical Departures from Conventional Motor Car Construction.

THE distinction of manufacturing the first practical front drive pleasure automobile in America is claimed by the Homer Laughlin Engineers' Corporation, Los Angeles, Cal. A "home" product throughout, the initial Laughlin eight was recently turned out of the factory after two years had been spent in perfecting the design.

There is to be found in the Laughlin eight a radical departure from typical construction and very interesting possibilities. In fact, the design discloses several unique features, of which the most conspicuous is the transfer of the method of the application of power from the rear to the front wheels.

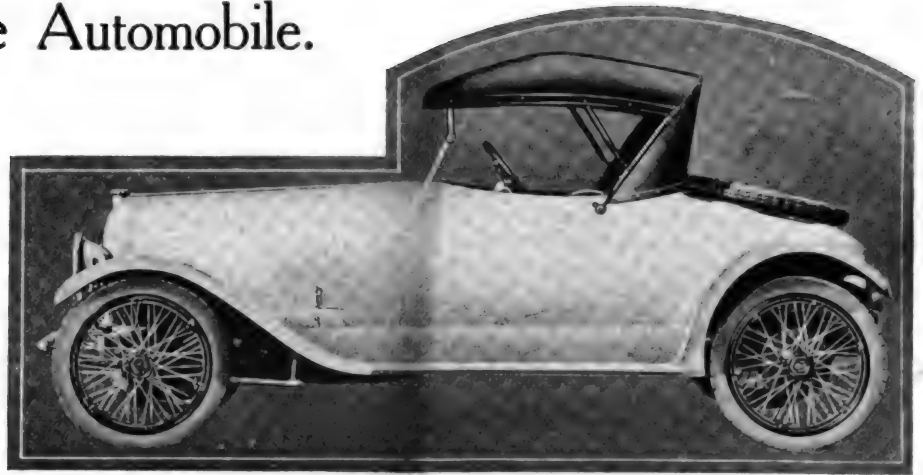
While this is not an entirely new principle in motor vehicle engineering, and has long been known to possess certain very pronounced inherent advantages, it has never been adopted in this country in a pleasure vehicle design, although there have been three or four successful examples of the construction in European countries. Certain factors have interfered with its development, the principal one being, probably, the difficulty of devising a suitable arrangement for transmitting power to the front hubs through flexible steering knuckles.



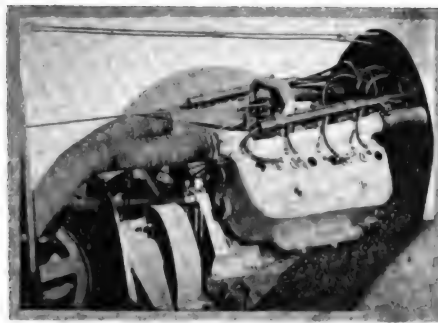
Components of the Universal Joint.

As solved by the designer of the Laughlin car, he has incorporated the front drive principle without the use of a cumbersome, noisy and unmechanical joint in the driving shafts. The joint used consists practically of only two pieces, and wear upon it is almost imperceptible after long usage. It is placed in the steering knuckle and permits of greater angularity than the average universal member, and yet it is compact in dimensions, occupying little more space than would an annular ball bearing adaptable to the same size shaft.

Among the advantages claimed for the front wheel drive are decreased tractive resistance, permitting the car to negotiate deep sand and other hard going that would be impassable to the ordinary car; better steering qualities at high speeds, the car being free from a swerving tendency; reduction in skidding proclivities and increase in life of tires. The use of



The Laughlin Front Drive Roadster.



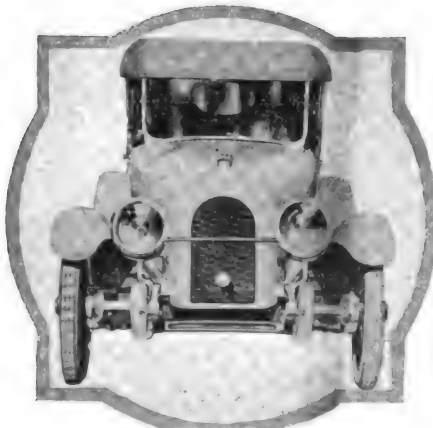
The Eight-Cylinder V Motor.

a lighter rear axle also adds immeasurably to the easy riding qualities.

The car has been thoroughly tested during the past two years over exceedingly difficult roads in the West. It has been found that its ability is largely a result of being pulled over obstacles instead of being pushed over them by the rear wheels.

The riding qualities of the car are also attributed to the use of a novel spring suspension. The superior resilience of the cantilever spring has been doubled by the insertion of a compound cantilever spring between the frame and the rear axle. The Laughlin corporation has applied for a patent on this exclusive arrangement.

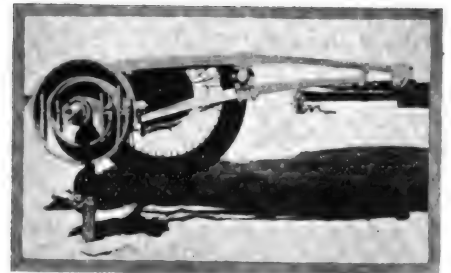
The motor is a small V type, eight-cylinder, with $2\frac{1}{4}$ -inch bore and $3\frac{3}{4}$ -inch



This View Displays the Graceful Lines of the Car.

stroke, and is rated by the S. A. E. formula at 16 horsepower, but is said to develop 25 at 2200 revolutions per minute. The crankshaft and camshaft are carried in Hess Bright ball bearings. The connecting rods are side by side on the cranks, which arrangement eliminates the necessity of using yokes. The push rods and valve adjustments are very accessible.

The lubrication system is a special design, the invention of the makers of the car, who have applied for a patent. The company asserts that it has never failed to give satisfactory results and that it is economical in consumption of oil, running a thousand miles to a gallon, though at the same time the distribution of oil to each cylinder and its parts is positively



Illustrating the Compound Cantilever-Spring Arrangement.

maintained at all speeds and loads. The system permits the elimination of the conventional pump and all other moving parts for oiling, and requires no other attention than the replenishing of the oil supply once or twice in every thousand miles of operation. Cooling is by the conventional thermo-syphon system.

A conspicuous feature of the electrical units is their high grade quality and their placement so as to obtain the maximum accessibility. The ignition system is an Atwater-Kent outfit.

The limited engine power, combined with the extremely low weight of the car, which is 1600 pounds, permits of the use of a simple friction transmission. This is located under the hood, as are all moving parts of the machine, excepting, of course, the rear wheels. Foot pedal actuation of the transmission discs is employed, making the control comparable

both in appearance and handling to the conventional automobile. Nothing is left to the judgment of the driver, however, as to the degree of pressure to be applied, this being automatically taken care of by the pedal control mechanism itself. The advantages claimed for this type, which is designated as the "Laughlin friction transmission," are smoothness in starting and facility in handling in dense traffic without shifting from high gear. Patents are pending on the system.

The bearings throughout the car are imported S. K. F. and Hess Bright, including those in the wire wheels, which are regularly supplied with demountable rims.

The hand and foot brakes have independent drums, concentrically mounted on the rear hubs and engaged by internal expanding shoes.

The weight of the car load is carried equally by the front and the rear axles and the tire mileage consequently obtained is said to be extraordinary. This is because of the even distribution of the load between the two sets of tires, combined with the lightness of the car and

the smoothness of operation due to the combination of an eight-cylinder motor with the friction drive.

Tests have shown that the only effect of the front wheel propulsion on the steering of the car is to give it a decided tendency to hold to the road.

The wheelbase of the roadster model, the only type that will be produced this year, is 112 inches. The tire sizes are 30 by 3½ inches.

In outward appearance the car has distinctive lines, there being a straight sweep from the radiator with a sloping rear deck on which is carried a spare tire. The fenders are exceedingly graceful and harmonize well with the general contour of the body. The windshield is made so that the lower half has a pronounced rakish turn so that when the top section is folded down the lower half acts as a wind deflector, without obstructing the view of the road.

The Laughlin car is covered by five patents. During the next six months the company will turn out two cars daily, and within a year the output is expected to be increased to five a day.

cess of making gasoline, states that the cost of production by that method ranges from seven to 12.8 cents, according to the price of crude oil. Mr. Manning said:

"You will note that using fuel oil from which the gasoline had already been removed by ordinary methods, and paying for this fuel oil as high a price as \$2.10 per barrel, the cost of producing a gallon of gasoline by the Rittman process is 12.8 cents, while with a cost for fuel oil of 50 cents per barrel, the cost of producing a gallon of gasoline by the Rittman process is 6.9 cents. In other words, results obtained in this five days' run indicate not only that the Rittman process can be operated with financial success at the present high price of crude oil and gasoline, but that its use will bring profitable results with the lower crude oil and gasoline prices prevailing in the past."

Two concerns are already producing gasoline under the process and 18 others have taken out licenses from the government for the use of the Rittman process.

EXPORTING OVERLANDS.

One of the interesting features of the big plant of the Willys-Overland Company at Toledo, O., is the export dock where the cars are packed and shipped for all parts of the world. When a finished car has been marked for foreign shipment it is driven to the dock and run on a planked bottom of a shipping case. After the gasoline is drained the wheels are taken off, steering column dismantled and top taken down. These parts are firmly lashed in place and the sides and top of the case put on, the interior being lined with waterproof paper to prevent the salt air on the ocean from rusting any of the parts. When the shipping directions are stenciled on the cases are transferred to a freight train and sent to New York City or the Pacific Coast.

PAINT FOR METAL GARAGES.

The portable metal garage is distinctively for the average man, because it occupies but small space and can be moved when desired. The Joseph Dixon Crucible Company, Jersey City, N. J., specializes in a protective paint suitable for metal garages, as well as for wooden types. This company's silica-graphite paint, made of an unequalled American pigment in four colors, has been manufactured for over 50 years and is used in all parts of the world.

The method of application is as follows: Wash the galvanized iron or metal work (if it is new) in a solution of sal soda, so as to clean off shop grease, etc. The structure should then be given three coats of Dixon's paint. If, however, the metal has been previously painted, scrape off blisters and loose scale. Then apply two coats of Dixon's paint, using different colors to determine that the coats are uniformly applied to the entire surface.

AUGUST 25, 1916.

RESPONSIBILITIES OF OWNERS.

Timely Warning by Head of A. L. A.

Very few automobilists are acquainted with the statutory rights of the guests or passengers that ride in their cars. In Massachusetts there is a very important law covering the legal rights and liabilities of the guest or passenger. A definition of this law recently given by Secretary Thibodeau of the Automobile Legal Association, clearly explains it and is of interest to every motorist. He defines the rule in regard to this law as follows:

"The operator's negligence is not chargeable or imputable to the passenger or guest so as to make him either liable for the operator's acts or deprive him of his right to recover for an injury he has sustained either because of the driver's carelessness or the latter's negligence combined with that of some third party.

"For example, where a passenger in a taxi cab, jitney or sightseeing bus is injured by the joint carelessness of its chauffeur and the driver of some other vehicle, the owner and driver of either or both vehicles are responsible to him and he may seek redress against the owner or driver of either vehicle or against both of them. Contributory fault always bars the right to recover, but the hirer of a taxi or other public conveyance does not assume risk of the driver's careless driving, and, even if this was partly the cause of the accident, the passenger may also look for redress to the owner of the other vehicle."

"The same principle applies where the passenger is a guest in a private machine. If he is injured by the collision of two cars or vehicles caused by the negligence of both chauffeurs, he not

only may hold his host responsible, but also may proceed against the owner of the other vehicle, since each is a wrongdoer; and, if he should care to exonerate his host and confine his claim to the third party, the latter cannot excuse himself because the host, perhaps, was also careless, inasmuch as the carelessness of the host is not lawfully imputed to the guest.

"However, there are important exceptions to this rule. If the guest or passenger is engaged at the time in joint enterprise with the host or owner of the car, the careless acts of the latter are chargeable and imputed to him and he cannot recover against the owner or operator of the other colliding vehicle that carelessly injured him. Thus, where the guest and host agree to share all the expenses of an automobile pleasure trip and both were injured through the negligent driving of another machine, it was held that the guest could not recover, the jury found that the host was guilty of contributory negligence.

"Of course, in any case, the guest or passenger to recover must be in the exercise of reasonable care, and where it was found that the passenger urged the chauffeur to drive the automobile at an excessive rate of speed, or acquiesced in a similar request by his companion, a fellow passenger, it was held he could not recover."

RITTMAN PROCESS.

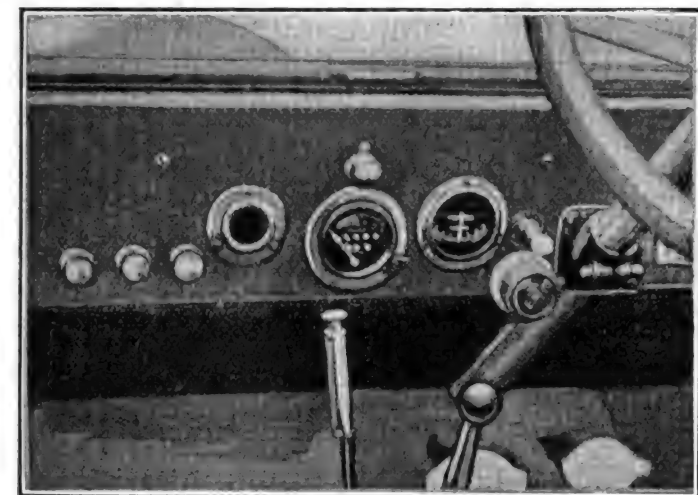
Director Van H. Manning of the Bureau of Mines, in his first report on the operations of the Rittman cracking pro-

OPERATES MOTOR WITH KEROSENE.

British Motorist Devises Means of Using Kerosene in His Car.

KEROSENE has many times been experimented with as an engine fuel in this country, but never with sufficient success to justify its general

use. In a recent issue of the Autocar, an English automobile publication, was published an article illustrating and describing an invention by F. A. Wilkinson, Hatfield, Hertfordshire, England, with which kerosene can be used in the ordinary gasoline engine without any admixture of a lighter fuel.



Three Push Button Control of Two Kerosene Valves and Air Valve at Left; at Right of Ammeter is Electric Heater Switch.

Mr. Wilkinson states that even with the installation of his device the chief disadvantages of kerosene are that until the engine becomes thoroughly hot, the exhaust is decidedly smoky and that the same flexibility of engine operation is not obtainable. The one viewpoint in the mind of the inventor has been to obtain a means of carburetion by which kerosene, which is plentiful and within the means of every motorist, can be used to operate the ordinary engine without structural alteration of the motor or carburetor.

Revolutionary Principle.

The basis of this invention is of somewhat revolutionary nature, in that a portion of the exhaust gas is injected into the intake manifold between the throttle and the engine. This hot gas mixes with the kerosene and air and enters the cylinders for the second time. Although it is but natural to suppose that the introduction of exhaust gases into the cylinders with the new charge would decrease the efficiency of the motor, exhaustive tests determine that the mileage per gallon when running on kerosene is reduced by only two miles as compared with gasoline.

The principle involved is shown in the accompanying illustration. A represents

the rear end of the exhaust branch, B the intake manifold, D a T piece which screws into the intake manifold, B and C a pipe having an internal diameter of $\frac{1}{4}$ inch, which is coupled between one arm of the T piece and the exhaust pipe A. In the pipe C is the valve E, which regulates the volume of exhaust gas admitted to the intake manifold. The control of this valve is obtained by a steel wire running through a copper tube and terminating at its upper extremity in one of three push buttons arranged in a row on the left rear face of the dash board and within easy reach

of the operator. It has been determined that when the engine is hot this valve should be about three-quarters open, and, as the engine speed decreases, it is advisable to close it slightly.

In another illustration is shown the three button controls on the dash. The button on the right controls the auxiliary air supply to the carburetor, the centre one the valve E, while that on the left operates another valve, H, the purpose of which is related in the next paragraph.

That kerosene may be used for starting purposes it is necessary to install an electric heater. It will be noticed that the second arm of the T piece D is attached to the pipe F, the internal diameter of which is $\frac{3}{16}$ inch. In the pipe F is located the valve H, which controls the passage of the kerosene from the heating pot G to the T piece D. For simplicity of explanation, the heater G is inset on the left of the illustration, but in reality it is fitted low down and on a

level with the carburetor float chamber. From the bottom of G a $\frac{3}{16}$ inch pipe connects with the bottom of the carburetor float chamber, so that the level of the fuel in the float chamber regulates that in the heater pot G. Into the lid of G are inserted two terminals L, which are insulated from the metal of G and connected together inside the heater by the resistance wire M.

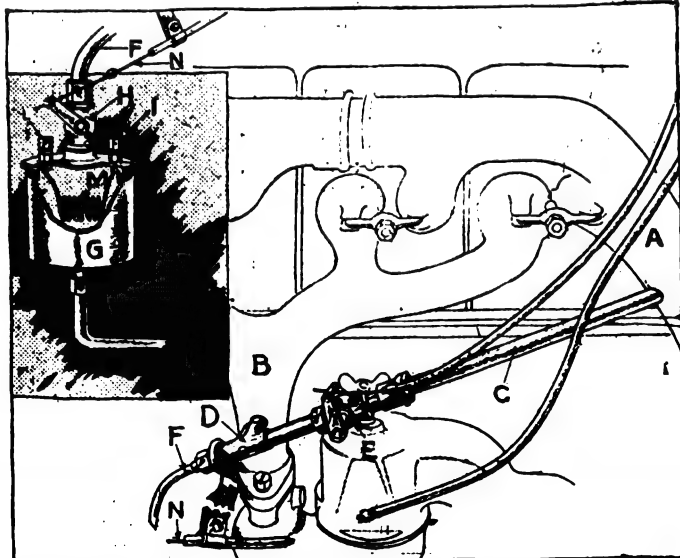
The current is taken to the terminals L from the electric lighting battery, the heater being arranged to operate from either a 12-volt or a six-volt source of current. A switch is located on the dashboard of the car and by this means the current is allowed to pass through the heater G. Included in this circuit is a small inspection lamp, mounted near the switch on the dash.

Starting When Cold.

When one desires to start the engine when cold the valve E is closed, the valve H opened by means of the control wire N and the carburetor throttle closed so that the suction of the pistons causes a reduction of pressure in B, which is transmitted through D, F and H to the kerosene in G. Before a start can be made it is also necessary to turn on the current through the resistance wire M in the heater G, and leave it on for about $2\frac{1}{2}$ minutes. At 12 volts the amperage discharge is approximately 16 and if a six-volt battery is used there will be about a 32-ampere discharge.

After the resistance wire M has been heating the kerosene in G for the stipulated time, the fuel in G becomes very hot and smoke will be seen to issue from the heater pot. The current can then be switched off and the engine started either by the electrical starter or hand crank.

The inventor stated during a test conducted with an Overland car that immediately after the motor is started the car should be taken out on the roadway and made to pull on an open throttle so that the greatest amount of heat possible will be taken from the exhaust pipe through the by-pass C. It was also noted that no



Wilkinson By-Pass Kerosene Vaporizing Attachment, Inset Showing Electric Heater for Starting.

fuel was drawn from the heater G except at the moment of starting. When firing commenced the valve H was closed and the valve E opened, as was also the carburetor throttle valve. The specific gravity of the kerosene used for the test was .798.

Mr. Wilkinson states that the electric heater is not absolutely necessary for starting, as the kerosene can be drained from the carburetor float chamber and then filled with gasoline. The heat developed in this manner is sufficient to enable the operation to be maintained on the heavier liquid after the gasoline has been consumed.

A noteworthy feature of the by-pass paraffin attachment is that should one ever desire to operate the engine with gasoline the only necessary change is to

close the two valves E and H.

There may be no organized or concerted endeavor made in America to utilize kerosene as engine fuel so far as pleasure cars are concerned, because there is greater degree of "carbonization" or incomplete combustion in engine in which kerosene is used because the oil burns slowly and is not always completely consumed, but there is no doubt whatever that kerosene will be an extremely economical fuel for trucks and farm tractors, which are multiplying in numbers very rapidly. Not only this, the far greater safety of kerosene, for it is not as combustible as gasoline, is a distinct factor, and the price is comparatively small as compared with the present cost of fuel.

MAKERS SUPPORT GOVERNMENT.

Nearly 2000 Pleasure Cars and Trucks Could Be Supplied Every Day If Needed.

Alfred Reeves, general manager of the National Automobile Chamber of Commerce, who attended the meeting of the advisory board of the general staff of the United States War Department, held during the time when the Mexican situation was acute, said that the automobile manufacturers of the United States gave the government officials assurance that 900 motor trucks and 1000 passenger motor cars could be supplied every day if required. The government officials, Mr. Reeves says, declared that this supply would meet any contingency.

He also states that the automobile manufacturers stand ready to stop exporting should the government's need of their product become urgent, but that any demands the War Department might make would not interfere with the ability of the makers to supply private requirements.

"The factory members of the National Automobile Chamber of Commerce," says Mr. Reeves, "proposed to the government to train army men in their plants so as to familiarize them with the gasoline engine and the construction of the motor car and make them capable of handling the motors of aeroplanes, trucks and cars. This offer was accepted. Ten men a month are to be trained in each plant, making a total of 500 a month. The course will last two months for each man.

"In order to work for the motor truck preparedness we are going to 'zone' the country and lay out a definite plan of what each state will be required to furnish in trucks and men in connection with an army up to 3,000,000. This plan is to cover factories, automobile dealers and individual owners of trucks, and it concerns national preparedness over and above the Mexican situation."

MOTORS IN YOSEMITE PARK.

The restrictions formerly placed on

motorists entering the Yosemite National park have been largely removed and the beautiful section is being visited by thousands of automobilists from all parts of the country. During the first six months of the present year over 2700 motorists entered the park.

GRAND PRIZE FOR PACKARD.

The grand prize, the highest award for motor cars and trucks exhibited at the Panama-Pacific International Exposition, San Francisco, has been delivered to H. H. Hills, sales manager of the Packard Motor Car Company, and now constitutes the principal exhibit in that official's office in Detroit.

Mr. Hills has a letter from Mr. Fernbach, secretary of the Superior Jury, in which he states: "I beg to inform you that the award to the Packard Motor Car Company as adjusted, of grand prize for motor vehicles, naturally goes to the merit of the products exhibited. The grand prize does not mean merely a grand prize on the exhibit, but it means a grand prize on motor vehicles, which includes motor cars and trucks."

SANTA MONICA RACES.

Work has started on the Santa Monica eight-mile race course at Santa Monica, Cal., in preparation of the Vanderbilt Cup and International Grand Prize races that will be staged there on Nov. 16-18. An energetic campaign is being waged to make these two events the banner contests of the year, and it is expected that every star driver will be among the entries as the results will figure in determining the racing championship honors of the United States. These races being the last to be held in the class of championship award events during 1916, they may prove to be the deciding contests.

PAIGE CLIMBS MOUNTAIN.

A Paige Fairfield "Six-46," after winning the silver cup for being the first car of 1916 to reach the government camp at the base of Mount Hood, in Oregon, was sent after the mountain climbing record, reaching 9500 feet above sea level on the mountain.

It was undoubtedly the most hazardous undertaking ever attempted in a motor car and a full month was spent in making the trip. When the car was turned back at a point where it became impossible to proceed further on account of the snow, it was resting on a grade of 50 per cent. An idea of the difficulties attending the climb are gained from the fact that the snow was 25 to 150 feet deep in places, a 75-foot canyon had to be crossed and there was no road or trail to be followed.

ROUGH TRIP IN OVERLAND.

An ambulance built on a model 75 Overland chassis for the army recently made a strenuous and rough trip over roads thought almost impassable between Brownsville, Tex., along the Rio Grande to Fort Ringgold, a distance of 293 miles. The trip was made in 15 hours. George W. Graham, president of the Overland-Houston Company, made the trip with a guide and upon his return stated that he considered the run the hardest test the little Overland has had. The round trip was made without a single mishap, through hub deep sand and heavy mud and part of the time over a trail that was unmarked.

ROAD WORK UNDER WAY.

The road bureau of the Portland Cement Association has compiled figures on the proposed road work in the various states, which shows that in five states contracts have so far been awarded this year for 1,000,000 or more square yards of concrete pavement. The figures for nine states are as follows: Illinois, 1,412,789 yards; Ohio, 1,391,430 yards; Indiana, 1,342,095 yards; Iowa, 1,000,291 yards; Michigan, 606,113 yards; Wisconsin, 546,203 yards; California, 448,749 yards; Texas, 530,470 yards.

The greater portion of the yardage is for country highways, excepting in Iowa, where most of it is for city streets.

SAN FRANCISCO SPEEDWAY.

The site for San Francisco's big speedway project has been selected and the speedway corporation has closed negotiations for approximately 165 acres of land within the city limits of San Mateo.

"Think of the other fellow and dim that headlight," and "get numbers of criminally careless motorists" are samples of some of the pithy expressions that were inscribed on the sides of motor delivery cars in Pittsburg recently as part of a Safety First campaign being waged in that city.

AUGUST 25, 1916.

Smart Apparel for Fall Motoring.



Lace Motor Veil Attached to Brim of Poke and Held Under Wearer's Chin with Bonnet Strings Matching Hat Trim. (J. M. Gidding & Co., New York.)



Army Blue Military Suit of Soft Velour, Trimmed with Buff Broadcloth. Coat Single Breasted. (Oppenheimer & Trebitsch, N. Y.)



Matching the Color of a Veil to That of the Car Is Vogue. Georgette or Chiffon, Draped on Small Motoring Turban. (Gimbel Bros., New York.)



Motor and Restaurant Coat of Buff Material. (Gimbel Bros., N. Y.)

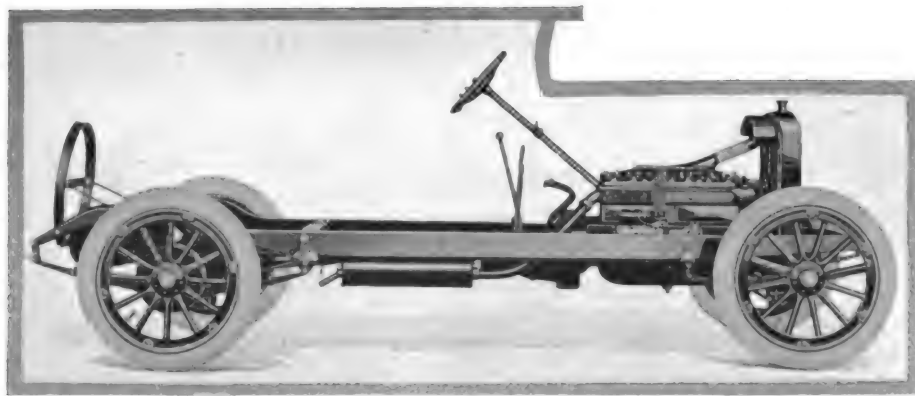
Two - Tone Striped Sweater Coat. (Wm. Ellene, Boston.)



All Photographs on This Page by Courtesy of Joel Feder, N. Y.



Oil-silk Hat and Coat in Plaid for Storms. (Franklin Simon, N. Y.)



The Chassis Is Trim, Yet Rugged.

THE Liberty car, a six-cylinder model, selling at \$1095, is designed to appeal to motorists who already own and drive expensive cars, the outstanding features of the machine being a striking body design, extreme simplicity of chassis construction and many refinements of detail. It is built by the Liberty Motor Car Company, Detroit, of which Percy Owen is the president and general manager.

In its general lines the Liberty car displays a colonial tendency of design. All the beautiful flowing lines that are the prevailing vogue have been retained, but are modified by sharper angles and straight lines. Noticeable at first glance are the straight lines of the hood, blending into a pleasing and graceful cowl. The usual bulge at the sides of the cowl has been omitted.

Wheelbase of 115 Inches.

The car is low and long and viewed from any angle is very attractive. The wheelbase is 115 inches and the body is particularly roomy, accommodating five passengers quite comfortably.

Appreciating the possibility that owners in the class for which this car is intended may desire to express individuality, wide panels have been provided at the tops of the doors for monograms.

In body measurements the designers have been particularly generous, providing an especially roomy driver's compartment. The tonneau is equally spacious and extra thick cushions make for riding comfort.

The chassis is of very trim, yet rugged

appearance, the connection of the frame to the axles with long, easy cambered springs and the underslinging of the rear pair giving it a low hung effect, which is accentuated by having the emplacement of the engine somewhat lower than is usual practise.

Continental Motor Used.

The motor is a six-cylinder Continental make, $3\frac{1}{4}$ by $4\frac{1}{2}$ -inch bore and stroke, with L head valve arrangement, the valves operating in long guides and being enclosed on the right side of the motor with removable cover plates. The engine is cast en bloc and develops 23.4 horsepower by the S. A. E. rating. The crankshaft is of the latest design of drop forged steel and well balanced. It measures two inches in diameter. Connecting rods are $8\frac{1}{2}$ inches long. The lower bearings measure $1\frac{1}{2}$ by two inches. The cams are integral with the camshaft and the complete shaft may be readily withdrawn upon removing the gear cover case. The timing gears are helically cut and are practically noiseless at all speeds. The camshaft gear is a special composition to prevent noisy operation.

The Lubrication System.

The motor is lubricated by splash and forced feed system. A horizontal plunger pump driven by an eccentric from the camshaft forces oil to the main bearings and timing gears. Connecting rods, camshaft and pistons are lubricated by splash.

The cylinder block has specially designed water jackets to care for the thermo-syphon cooling system. The in-

The Five Passenger

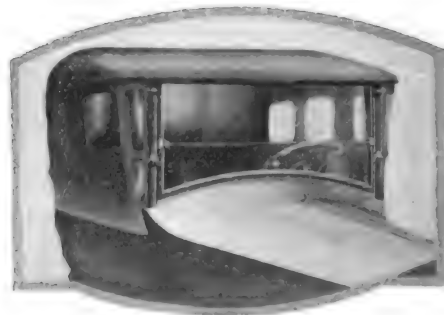
Body Design Has Beautiful Tendency Which Is Modified

Gallon Fuel Supply is Always

side of the water jacket is cleaned of all foreign matter, fins, core sand, core wire, etc., by a special process during manufacture to insure a thoroughly clean interior. The water capacity of the cooling system is 6½ gallons.

Carburetor Is a Rayfield.

A Rayfield carburetor of the float feed automatic type is bolted directly to the cylinder block, the intake manifold being integral with the block. The intake is water jacketed and has a hot air stove attached and connected with the exhaust. Vacuum feed system is used, the tank being supported at the rear of the car. This tank is of special construction, incorporating a three-gallon reserve compartment, which is formed merely by there being a dividing wall perforated by two $\frac{1}{2}$ -inch holes located well toward the top of the partition. When the main tank is filled to the height of these holes



Windshield Has Rubber Strips at the Sides.

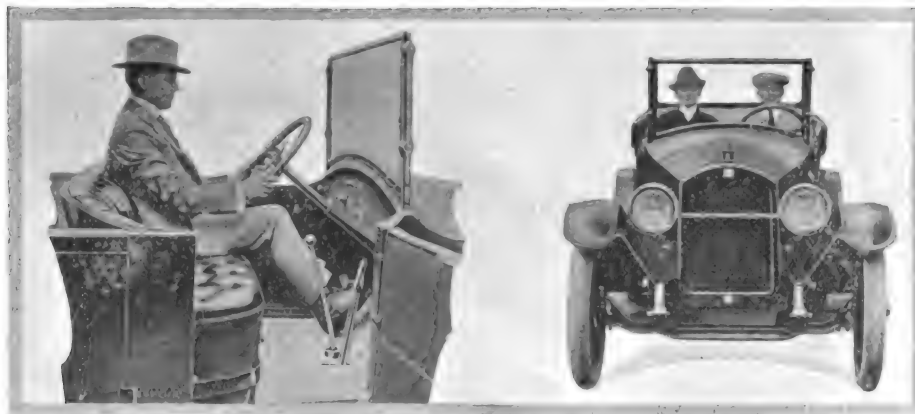
gasoline flows through, filling the reserve tank. Two tubes, one on each side of the partition and terminating in a three-way cock and leading to the main gasoline line, constitutes the very simple control. Only one tube is used at a time. To obtain fuel from the reserve the driver need only turn the handle of the cock.

The electrical system comprises a two-unit Delco installation, the motor being at the left and equipped with Bendix drive to engage the toothed flywheel. The battery instead of being carried under the frame is placed in metal lined wood box under the front seat, where it is protected from moisture and dirt and is accessible. The generator is carried on the right side of the engine and the distributor is mounted on the front of the generator. The complicated set of levers usually employed to control the distributor from the steering wheel has been replaced by a flexible wire cable, which works on the principle of an attenuous release. The ignition equipment is a Delco make.

Power Plant in Unit.

Three-point suspension of the power plant is used, the gear set forming a unit assembly with the motor. The three-disc

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Driver Has Plenty of Leg Room; the Graceful Cowl Is Shown in View at Right.

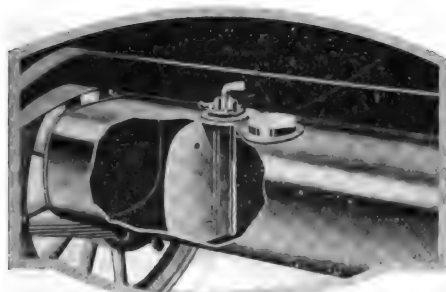
Liberty Six Model.

Lines, Displaying a Colonial by Sharp Angles --- A Three In Reserve for Emergencies.

dry plate clutch is so connected with the clutch pedal by means of multiplying toggle action that very slight pressure overcomes the powerful clutch spring. Transmission is of the selective sliding gear type with three speeds forward and one reverse. New Departure ball bearings are employed on the main driving shaft and plain bronze bearings on the counter shaft.

Details of Transmission Brake.

The gear box is of conventional construction, except that it incorporates a generously proportioned contracting band brake on the transmission shaft, this being connected to the hand, or emergency lever. This type of brake has been used with great success in foreign cars and, located on the drive shaft, obtains the added leverage of the rear axle gear ratio, which multiplies the braking effectiveness by more than four times. It has an extra big braking surface—63



This View Shows Construction of Fuel Tank.

square inches—and operates quickly. It is said that the brake can be set to a full stop by the pull of one finger. This ease of operation is noticeable throughout the Liberty car's construction, particularly in the changing of gears. The emergency brake is of the external contracting type.

As no torsion tube is used in this design a universal joint is carried on each end of the tubular propeller shaft. Terminal drive is skew bevel pinion and gear. The semi-floating axle is a standard Timken product, as is also the drop forged front axle. The differential is of the two pinion type, and there are two Timken bearings back of the bevel drive pinion.

Semi-Elliptic Springs.

Both front and rear springs are semi-elliptic and are mounted directly under the frame. The rear set are underslung and not only transmit the drive, but take the torque reaction of the live axle. All spring eyes are bronze bushed.

The frame has straight side rails, which taper to a narrowed width at the front to permit of ample steering wheel lock and short turning radius. The steering gear is of the worm and full



The Liberty Car and President Percy Owen.

wheel type, the wheel measuring 17 inches in diameter, with a horn button located in the centre of it.

Provision is made in the body construction for the mounting of a removable limousine top so that perfect fitting and easy attachment are assured when it is desired to convert the touring model into a closed car. The attachment of side curtains is so that they swing with the door, which allows easy entrance and egress.

Inclined seats add to the comfort of passengers and the details and fittings of the body are nicely worked out. An example of this is found in the tool compartment back of the driver's seat, with access by a panel door opening into the rear compartment. Additional storage space for tools and equipment is located under the driver's seat. Pockets are also to be found in the rear door and in one of these is a clothes brush as regular equipment.

Equipment Very Complete.

Equipment is complete in every detail, including one-man top with cover, rain vision ventilating windshield, speedometer, demountable rims with one spare, robe carrier of adjustable type, motor driven horn, headlights with auxiliary bulbs, tail and license light, dash lamp, quick adjustable inside fastening storm curtains with Collins irons on right hand door and full tool equipment.

In addition to the five-passenger touring car the Liberty company will also build on the same chassis a number of open and closed body types. Among these will be a close coupled four-passen-

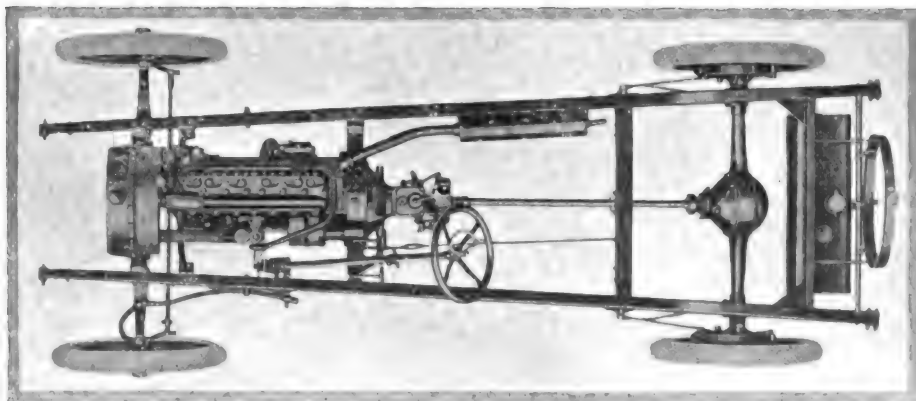
ger open body resembling to a certain extent the popular four-passenger roadsters. The closed bodies will in every way be of distinctive design.

NEW TRADE LITERATURE.

The specialties department of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has issued for distribution a new edition of its Automobile Lighting Switch booklet. In the book it is stated that there are more than 1,000,000 C-H switches in use on Packards, Overlands, Studebakers, Buicks, Detroit Electrics, Haynes, Pullmans, Fords, and many other cars of equal note. The first page shows several assemblies of C-H switches installed on some of the aforementioned cars. On another page is a phantom view showing the three-piece construction and operating principles of the switch. The latter part of the booklet is devoted to wiring diagrams showing the method of wiring for single lamps and various lighting combinations.

"GEARED-TO-THE-ROAD."

The latest issue of "Geared-to-the-Road," the house organ of the Miller Rubber Company, Akron, O., contains several articles, as well as illustrations, of particular interest to garage owners and workers and dealers. One of these concerns, the "largest garage in the world," is located at Colorado Springs, Col. Two other articles of much interest relate to credits and to increasing the efficiency of window displays.



Here is Shown the Extreme Simplicity of the Chassis, in Which Rods Are Not Employed.

The Scripps-Booth Four and Eight.

Motors More Powerful Than Last Year,
and Bodies Show Characteristic Designing.

THE complete line of Scripps-Booth cars, produced by the Scripps-Booth Company of Detroit, Mich., includes an improved four-cylinder, three-passenger model and a new eight-cylinder, with a four-passenger body, which has lines that somewhat resemble those of the former Scripps-Booth machines. The cars as a whole have that distinctive appearance which enables one to readily pick out a Scripps-Booth on the road or in city traffic.

As compared with last year's car, the four-cylinder model is much improved and refined, at an advance in price of only \$50, it now selling for \$825. The coupe of this model sells for \$1450. The new eight, which has a wheelbase 10 inches longer than the four, namely, 120 inches, and a much more powerful motor, is listed at \$1175.

With the exception of the power plants the two Scripps-Booths are much of the same general design, though, of necessity, they differ in some details. In the four-passenger body it is evident that much thought has been devoted to evolving a type that would afford the maximum of comfort, sociability and good taste. It has separate front chairs, the aisle between being for the rear seat passengers, who use a 34-inch unbroken seat. A tendency toward the double cowl effect has been obtained advantageously, while the characteristic Scripps-Booth bow-shaped cowl and tapered hood with V shaped radiator have been retained without much alteration. The rear deck displays much the same appearance as that of the roadster, and there is a wire wheel rakishly mounted on the end of it.

In the general layout of the chassis



The Four-Cylinder Coupe Model, Which Is Listed at \$1450.

there has been little change made, excepting in the power plant, which shows the hand of the same designer in both models. In the motors the design adheres to the overhead valve construction, with adjustment for the rockers outside and in an exceedingly convenient situation. The bore of the four is three inches and the stroke $4\frac{1}{4}$, while that of the eight is $2\frac{1}{2}$ and $3\frac{1}{4}$ respectively. The new four has considerably more power than the 1915 engine, it developing 25 horsepower in actual test. The eight

shows 35 horsepower in actual operation.

The valves are inclosed completely at the top, and by means of a nut it is possible to adjust the valve clearance even while the engine is running. In the case of the four-cylinder motor a change in method of support has been made, the back part of the engine being supported directly in the frame on either side, instead of hanging the rear from a bridge as formerly.

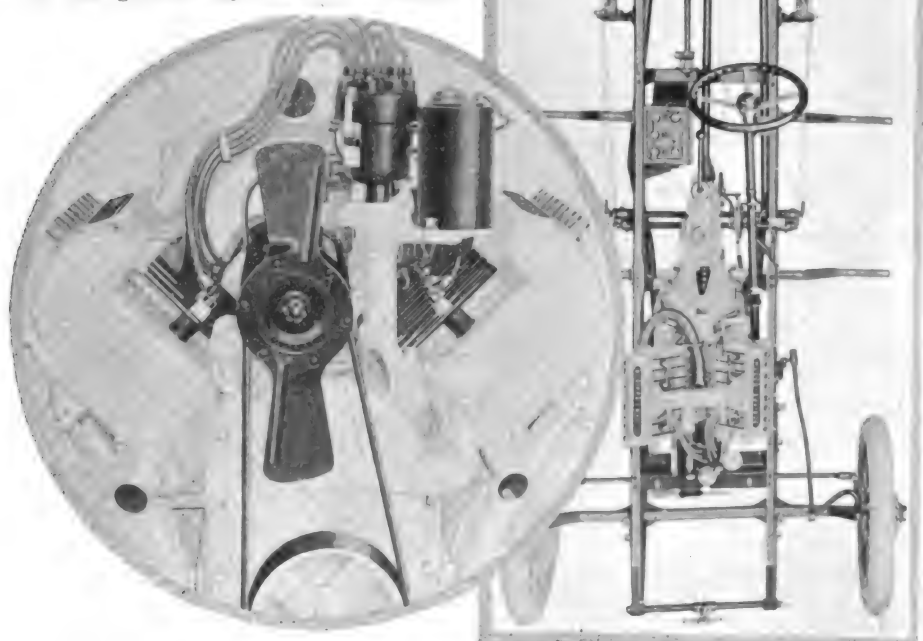
The single-unit starting and lighting system formerly used in the roadster has been replaced by a two-unit Wagner installation in both models. The starting motor is located on the right and close to the flywheel, so that it can connect easily with the flywheel. Meshing and demeshing is accomplished by the now popular Bendix drive, the operation consisting of throwing on the starting current by means of a switch in the foot-board, which automatically meshes a pinion on the starter shaft with the flywheel rim, and once the speed of the engine exceeds that of the starting unit this pinion is automatically demeshed. The starting motor is hung from a bracket below the upper part of the crank case and consequently is out of the way.

The generator on the four is carried on the left hand side and is driven by the camshaft through inclosed gearing. On the eight this component is mounted in the block between the cylinder castings, and is driven by a belt. The lighting system includes two-bulb dimmer headlights, tail lights and a shrouded instrument board lamp. In other details of equipment the two plants are similar, they having Remy automatic advance ignition, a Zenith double hand and foot throttle controlled carburetor and multiple disc dry plate clutch.

In the ignition system the distributor is vertically mounted and is driven off the front end of the camshaft by a worm gear. Close to the distributor is the coil, and both are in close proximity to the generator. As a result the electrical apparatus is closely grouped, which makes for shorter wiring.

The Zenith carburetor is mounted on the right hand side and there is no external manifolding, which exhibits the

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In This View of the Chassis Is Shown the Piano Wire Brake Cables; at the Left Is the Eight-Cylinder Motor.



Here is Seen the Graceful Lines of the Four-Passenger Body on the Eight.

general tendency toward simplicity in the Scripps-Booth power plants. The gas passes from the carburetor through the single opening by which the instrument is connected to the motor and is cared for within the cylinder casting. The exhaust manifold is large and amply proportioned to furnish egress for the burned fuel.

In the lubrication system of the four the pressed steel pan at the bottom of the crank case is sloped, so that the oil will flow back to the reservoir at the rear, whence it is drawn by pump and delivered to the connecting rod troughs. The eight has the pressure system, the oil being supplied to the motor bearings by pump and thence through drilled passages in the shaft to the crank pins.

The motor parts of both models are cooled by the conventional thermo-siphon system, aided by a large fan and a V shaped radiator, which is finished in polished German silver.

The engine is in unit with gear box and clutch. The clutch is a multiple disc dry plate, while the three-speed gearset is conventional construction, it being very compact and bolting to the semi-housing that encloses the top of the fly-wheel and is an integral part of the cylinder casting. The propeller shaft is tubular, with spiral bevel drive axle, and is fitted with two universal joints. The rear axle is a three-quarter floating type with Hyatt roller bearings. The front axle is an I beam type.

Scripps-Booth being the pioneer in the use of piano wire cable to connect the brake operating levers with the levers of the brake camshafts, the practise is continued in both of the new models. These cables are amply strong for their purpose and have the added advantage of extreme simplicity. They are equipped with a very easy means of adjustment to take up the slack.

The exceptionally easy riding qualities of Scripps-Booth cars can be ascribed to the use of full-floating cantilever springs at the rear. The front springs are semi-elliptic with over hung frame.

An outstanding feature of the eight-cylinder, four-passenger model, is the employment of the vacuum system of bringing fuel from the 13-gallon tank hung at the rear and below the deck on

which the spare wire wheel is carried.

The new four-passenger body is a clever design, all available space being

utilized to the passengers' best comfort. The back seat has been brought forward sufficiently so that the passengers sit ahead of the rear axle, which location has decided advantages.

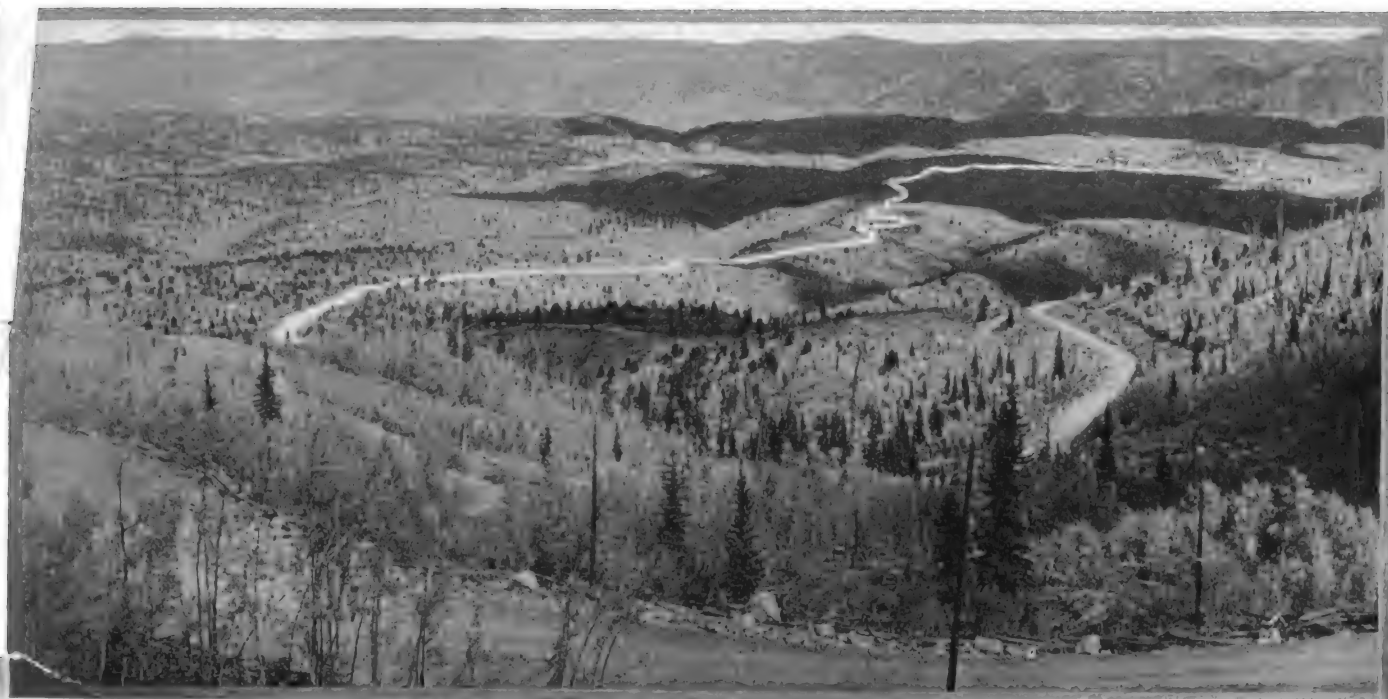
The wheel equipment consists of five detachable triple laced Houk wire wheels with clincher rims, they carrying 30 by 3½-inch Goodyear or United States tires on the four and 32 by four on straight side rims on the eight.

The standard equipment includes one-man top with side curtains, Klaxon electric horn operated by a three-inch push in the centre of the steering wheel, a double plate glass rain vision windshield with easy adjustment, a flush dial trip speedometer, ammeter, ignition, lighting and dimming switches, carburetor "strangler," special brackets for front and rear number plates, shrouded instrument light and the usual complete tool kit, including pump, jack, special wheel spanners, emergency starting handle, etc.



KISSELKAR ON THE PACIFIC COAST.

On a Mountain Trip Through Southern Washington, Four Citizens of Seattle in a Hundred Point Kisselkar Encountered Such Views as These—The Lower Illustration Shows a Skid on Which Lumber Is Slid from the Mountains to River



TO THE SUMMIT OF PIKES PEAK IN 19 MINUTES.

The Penrose trophy event, which was the principal contest of the racing carnival held on the new Pikes Peak Highway up Pikes Peak Aug. 11 and 12, was won by Rae Lentz in a Romano car. Ralph Mulford, in a Hudson Super-Six, was second, and Fred Junk, in a Chalmers Six, third. Lentz received \$3000, the first prize money, and the Penrose trophy. Mulford received \$1000. The distance covered was 18 miles, all up hill.

A heavy storm broke over the course and the drivers were greatly handicapped by the rain, sleet and hail that almost obscured the course.

The event for cars with 231 cubic inches piston displacement or under was won by Fred Junk in a Chalmers and another Chalmers driven by Stantz came in second, with Jones in a Grant, third. The event in which cars of 231 to 300 cubic inches piston displacement were entered was won by Ralph Mulford in Hudson Super-Six, with Buzane in a Duesenberg second.

The entries and results of the three events are shown in the following tables:

PENROSE TROPHY.

Driver	Car	Time
Lentz	Romano	20:55.6
Mulford	Hudson	21:40.5
Junk	Chalmers	22:46.7
Hughes	Hudson	22:53
Mortenson	Cadillac	23:30
Jones	Grant	25:42
Knowles	Ford	26:20
Stantz	Chalmers	26:28
Peterson	Ford	26:32
Morgan	Studebaker	28:23

CARS OF 231 CUBIC INCHES AND UNDER.

Driver	Car	Time
Junk	Chalmers	23:04.6

Stantz	Chalmers	23:29.9
Jones	Grant	26:03.3
Peterson	Ford	28:00.3
Wetmore	Saxon	28:43.4
Knowles	Ford	29:25.7
Spangler	Ford	36:58.8

CARS OF 231 TO 300 CUBIC INCHES.

Driver	Car	Time
Mulford	Hudson	18:24.7
Buzane	Duesenberg	23:48.4
Parish	Mercer	28:31.8
Oldfield	Delage	31:38.6

RESTA WINS GRAND PRIX.

Dario Resta, who is leading by a wide



Sharp Turn Near Timberline, at Mile Post 11; at Top of Page, a View of the Race Course.

margin all other professional drivers for championship honors this year, won the Grand Prix race at Chicago, on Aug. 19, taking the first prize of \$5000. His time in the final race of 50 miles was 29 minutes 52.49 seconds, an average speed of slightly over 100 miles an hour. Dave Lewis, who came in second, was close after Resta up to the finish, which he made in 29 minutes 56.77 seconds. He also furnished the spectators with the excitement that they had expected from a battle between De Palma and Resta, but the former failed to qualify in the first heat, being eliminated by motor trouble.

Buzane, Galvin and d'Alene finished in the order named. The race was run off in six heats. The first five qualifying heats were 20 miles each and the final 50 miles. Galvin made the best time in the preliminaries, winning the second at a rate of 103 miles an hour. Resta took the first heat with ease at the rate of 102 miles an hour.

CINCINNATI MOTOR SPEEDWAY.

The new Cincinnati motor speedway, at Sharonville, O., where the 300-mile race will be held on Labor Day as an opening event, is nearing completion. Trials have been made over that portion of the wooden speedway that is completed with small stock cars, and it has also been tested with heavily laden vehicles. No vibration was noticed and it was found to have excellent stability and cars have no trouble making the turn into the stretch near the grandstand.

Art Johnson, Billy Chandler and Dick Lewis have recently entered for the 300-mile event, making 12 entries to date.

AUGUST 25, 1916.

**PET COCK OPENER.**

(Figure 215 A.)

It is almost an impossibility for the operator to open the pet cock under the Ford crank case without soiling his clothing and hands. The device illustrated in the sketch will greatly simplify this operation. It consists of an ordinary broom handle, about 15 inches long. A slot is cut in the end of the handle to engage the pet cock under the car and a small hole is drilled through the opposite end and a cord inserted so that it may be hung on a hook in the garage. If desired the tool may be carried under the seat of the car so that it will be handy for use on the road. It is also useful for determining the quantity of gasoline in the tank.

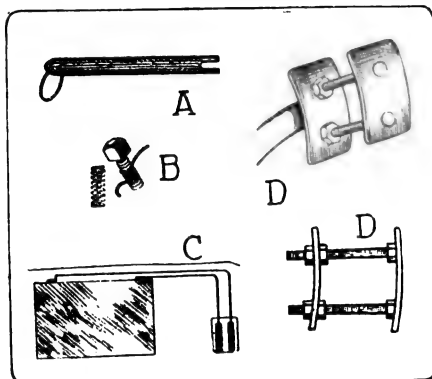


Figure 215.

MAKING COILED SPRINGS.

(Figure 215 B.)

When it is necessary to wind a small helical spring a small set screw can be used for the purpose. The screw should be firmly gripped in a vise and the wire wound around the threads as illustrated in sketch. In this manner an accurately formed spring will be produced. To remove the spring from the screw it is only necessary to hold the wire and turn out the screw.

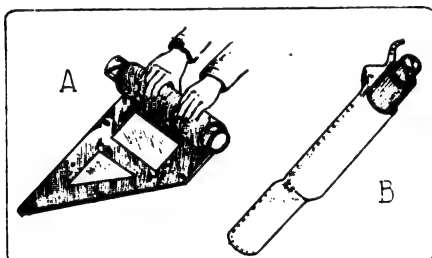


Figure 216.

DETERMINING THE POLES.

(Figure 215 C.)

Although there are several methods by which the negative and positive poles of a battery may be distinguished from each other, a simple and accurate test is shown in sketch. It consists of drawing some of the electrolyte from the battery into a glass tumbler. Into this liquid is placed two clean pieces of lead, to which the wires leading from the battery are attached in the manner shown. After the pieces have stood in this liquid for about five minutes it will be seen upon examination that one is covered with a brownish substance. The wire which was attached to this piece is the positive wire of the battery and, of course, the other is the negative.

CLUTCH PEDAL EXTENSION.

(Figure 215 D.)

Although practically all cars now have means of adjusting the clutch and brake pedals to vary their distance from the driver's seat, the maximum limit of this adjustment some times fails to bring the pedals near enough to the operator

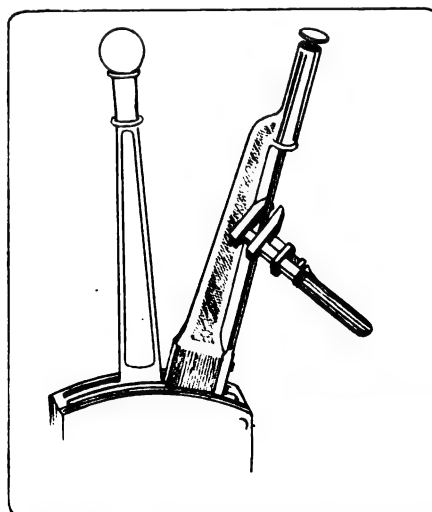


Figure 217.

to be reached easily, this being almost invariably true in the case of persons of short stature, and of children, who are permitted to drive in some states.

To overcome this difficulty extensions may be brought out from the pedals, the method of attaching these being shown in the sketch. The extension plates may be bent up from sheet metal, about 3/16 inch thick, and the studs, or bolts, attached to them by having beveled heads drop into countersunk holes in the plates and held in by nuts on the under side, as shown; or the plates may be malleable iron or bronze castings, in which case bosses could be cast on the under side, which could be drilled and tapped to accommodate the threaded studs. The latter pass through two holes drilled in the regular pedals and are clamped in position by two nuts.

CARE OF SIDE CURTAINS.

(Figure 216.)

On the lower priced cars the curtains are none too strong at best, and if it is desired to keep them available for use for any length of time it is quite essential to take some care of them.

The method suggested is to provide, assuming there are six curtains, three pasteboard mailing tubes, fairly large in diameter, using one of these on which to roll each pair. These rolls are then inserted in canvass or imitation leather bags, which are made to fit snugly. When protected in this way there is little chance for the celluloid to become scratched or cracked and the curtains are kept clean.

It is further recommended to have leather gussets, or reinforcements, sewn to the corners of curtains so that the eyelets will not pull out of the fabric when stretched over the Brewster fasteners. A harness maker can do this if no trimming shop is convenient.

NOISY BRAKE LEVER.

(Figure 217.)

On cars equipped with the thumb latch type of hand brake lever, there is often noticed a persistent rattle which, in the case of a driver whose nerves are sensitive, will set his teeth on edge by its endless clatter.

The rattle is caused by the slack fit of the thumb latch, or plunger, in the hollow hand grip extension of the lever,

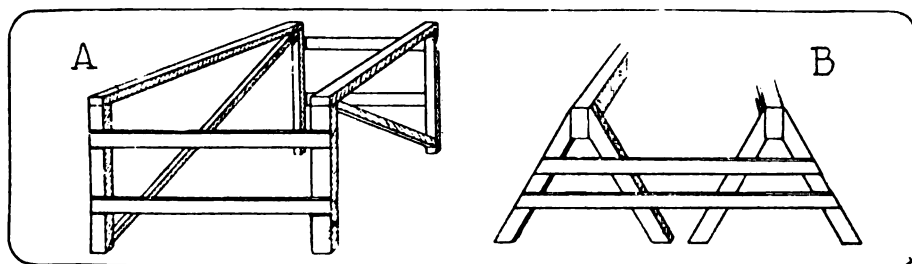


Figure 218.

and the remedy is extremely simple. With a wrench the light rod connecting the thumb button to the pawl at bottom of lever should be bent slightly, so that the rod, instead of floating loosely within the hand grip, will be cramped in the hole, bearing against one side at the top and against the opposite side at the bottom.

INEXPENSIVE HORSES.

(Figure 218.)

The owner who contemplates overhauling his car will usually find it desirable to remove the motor from the chassis to provide accessibility to all the parts. To do this it is necessary to provide a support of some kind on which to rest the engine at a convenient height. Two strips of wood (two inches by four inches) are sometimes used, having their ends resting on two stout boxes, but either of the supports shown in the cut are preferable, being more secure and easier to get around.

A shows the type of stand usually used in repair shops, this being made up of horizontal and upright members of two by four and suitably braced with strips of lighter section, say one by three. B shows a stand which can be made available in a very few minutes if two ordinary carpenter's horses are at hand, these simply being tied together in parallel arrangement at a distance apart to suit the engine, any light strips which are handy being nailed to the legs to hold them in position.

HOT AIR STOVE.

(Figure 219.)

Of the several means now generally employed to supply heat to the air and gasoline mixture, the heating of the air before it enters the carburetor, by means of a hot air oven, or preheater, is the most efficient, although still better results can be obtained, with present grades of fuel, by supplementing this with a jacketed manifold.

In some cases it will pay the owner to have a heater made, and the accompanying sketch will suggest a suitable construction, which can be made by the average tin smith.

A sheet metal tube is rolled up, having about one inch greater diameter than the exhaust pipe, on which it is held concentrically in place by three or four stove bolts equally spaced around each end, and engaging nuts resting against the inside surface of tube. The latter has flanges bent out, which are fastened together with stove bolts, to retain the

tubular shape. It also has an outlet ferule at its centre, to admit the end of a flexible tube, which should be larger than the rated size of carburetor, to prevent "wire drawing." This outlet is attached to the tube in the manner in which a smith usually makes up a tee, by notching the end with shears to form lips, which are alternately flared out against the outside and inside of the large tube, securing an effective fastening without solder.

CONTROL OF GARAGE LIGHTS.

(Figure 220 A.)

If an electric bulb is used to maintain

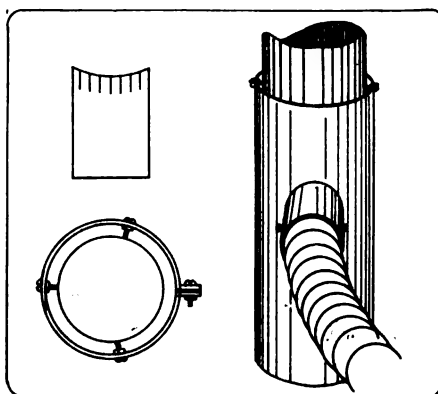
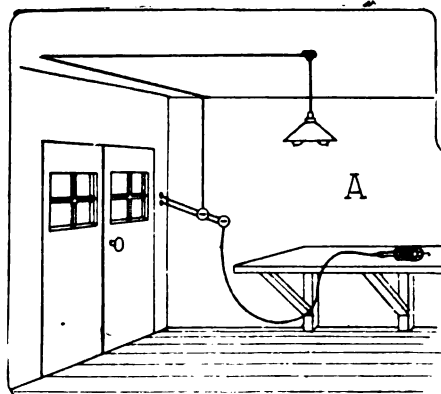


Figure 219.

an equable temperature around the motor of a car in a garage its convenience can be greatly enhanced by a simple arrangement of the wiring which need add but little to the expense. It is assumed that the garage wiring will be connected up to the residence.

The idea is to bring the garage leads into the house at a point where the installation of a service switch will provide easy access and having the "heater" bulb and light circuit in the



garage controlled separately by switches.

At night the lamps of the light circuit are turned off and the "heater" bulb is left on. If the weather is not severe, or the radiator of the car is protected by an anti-freeze solution, the switch of the latter may be opened in the house. If in the morning it is desired to warm up the garage the switch may be closed and the heat turned on without the necessity and bother of making a trip to the garage.

When taking the car out the "heater" bulb can be turned off in the garage, the house switch being left in so that the lights are available at night.

STRAIGHTENING FRAMES.

(Figure 220 B-C.)

Practically any motorist can straighten the frame of his car if it has become bent by using a jack in the manner shown in the illustration. The application of heat by means of a plumber's torch, not only makes the work easier, but enables the work man to localize and control the point where the metal will yield to the pressure of the jack, besides minimizing the danger of fracture.

If either the top or bottom web of the channel section has been partially torn by an accident, or in the straightening operation, the frame will be weak at that point and should be reinforced. This may be done by fitting a fitch plate to the inside of the channel, having its centre opposite the fracture and attached to the vertical web with rivets, as shown in the sketch.

REMOVING RUST FROM NICKEL.

Rust may be removed from nickel by smearing the parts with grease and allowing it to remain for several days. If the rust is not bedded too deeply in the metal it can be rubbed off with the grease, a cloth dipped in strong ammonia being utilized for the purpose. If it be very deep, apply a diluted solution of hydrochloric acid, taking care that it does not touch the metal. Wash and polish in the usual manner.

A method of determining self-hardening steel from the ordinary cast steel is to bring the metal into contact with a high speed emery wheel. If the sparks given off are of a bright red color, it is almost positive proof that the material being ground is cast steel. If the color of the sparks, however, is a dull red, the steel is of the self-hardening brand, the sparks of which are much similar to those given off from cast iron.

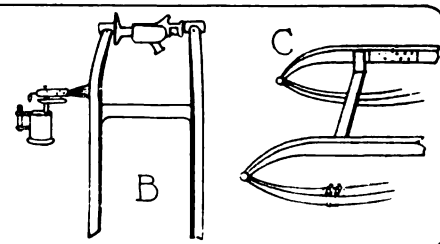


Figure 220.



REINFORCED concrete construction for garages is one of the strongest, most rigid and permanent constructions that can be used. Building by this method is not only simple, but makes for an absolutely fireproof structure which if properly constructed should not need any repair in the course of a life time. It is also subject to almost any design and finish.

The building described here is suitable for housing one large car or two small machines. It would be classed with the medium priced garages as it is not only larger than actually required to house one car, but has sufficient space for a roomy rear office or shop, where a chauffeur can make his headquarters. While entailing extra expense in providing this additional room, it is worth the expenditure considering its many uses. There is much paraphernalia in a full automobile equipment, much more in fact than can be conveniently carried about in a car, and a separate room where these different appurtenances may be kept is not only a convenience, but should prove economical, as it affords the installation of a more complete outfit for caring for the machine.

The method of construction employed is really casting, and wooden forms are used as molds. These forms can be made either the full height of the walls or in four foot sections, and should be of one-inch matched boards stiffened on the outside with 2x4 joist to hold them true to shape and prevent bulging. The foundation without side dimensions is 30 feet long and 15 feet wide and is put in first and should have a footing about four feet below the level of the ground.

This footing should be about 15 inches wide and

eight to 10 inches deep. Upon this is built the foundation walls, which should be about 10 inches thick, of concrete mixed of one part cement, 2½ parts sand and five parts crushed stone or other suitable material. In the previous number of The Automobile Journal the various conditions governing the selection of materials for mixing concrete were described, although it might be fitting to state that good cement, clean sand and sharply broken stone gravel, or slag, are required to get good results.

The next step is to erect the forms on the foundation walls preparatory to pouring the concrete, which for this part of the building should be mixed of one part cement, two parts sand and four parts of stone or other coarse aggregate. A six-inch wall gives sufficient strength when reinforced with ¾-inch round iron rods placed 14 inches apart horizontally and vertically. It is the best plan to build the forms entirely around, and to the full height of the walls, but this entails the use of considerable more lumber and carpentering work, while if properly handled, forms four feet in height are satisfactory. Care, however,

should be taken in making the pourings. They should be moved upward and fresh pourings made at least every day so that the lines where the two come together will amalgamate without showing any marked lines. The door and window openings should be placed in the forms while casting, and bolts with their heads in the cement should be placed along the sides of the door opening to secure the wooden door jambs.

Either a peaked or flat roof may be constructed and the appearance of the building is greatly enhanced by carrying the walls above the roof a foot or two all around the building, particularly in a flat roof, to conceal the slope which is made necessary to drain off the water. If it is to be a flat roof it should have a slope of about four inches toward the back. The same mixture of concrete as used in the walls is suitable for the roof construction and it may be laid the same thickness, although the reinforcing irons should be put five inches apart across the length of the roof and nine inches across the width. The reinforcing rods should be placed on a level about one inch up from the bottom of the roof and should be wired together where they cross, to prevent them from moving out of position when the concrete mixture is poured.

The forms on which the roof construction is laid should be strongly made and well supported and should be allowed to remain in place a week at least after the pouring. As there is no support for the arch over the door entrance, at the time the roof is being cast, provision should be made for a concrete beam five inches wide by 14 inches thick, including the depth of the roof extending from wall to wall. This



A Neat and Moderate Priced Concrete Garage to Which the Accompanying Suggestions Apply.

should be reinforced with a couple of one-half inch twisted steel rods placed two inches from the bottom of the beam.

The upper structure above the roof is made in the form of a balustrade or wall with a capping rail, which can easily be formed by nailing some strips on the outside of the top of the forms in the last casting. A tar and gravel finish on the roof, with a concrete cricket at the sloping edge, completes the main structure.

Concrete floor construction, which was

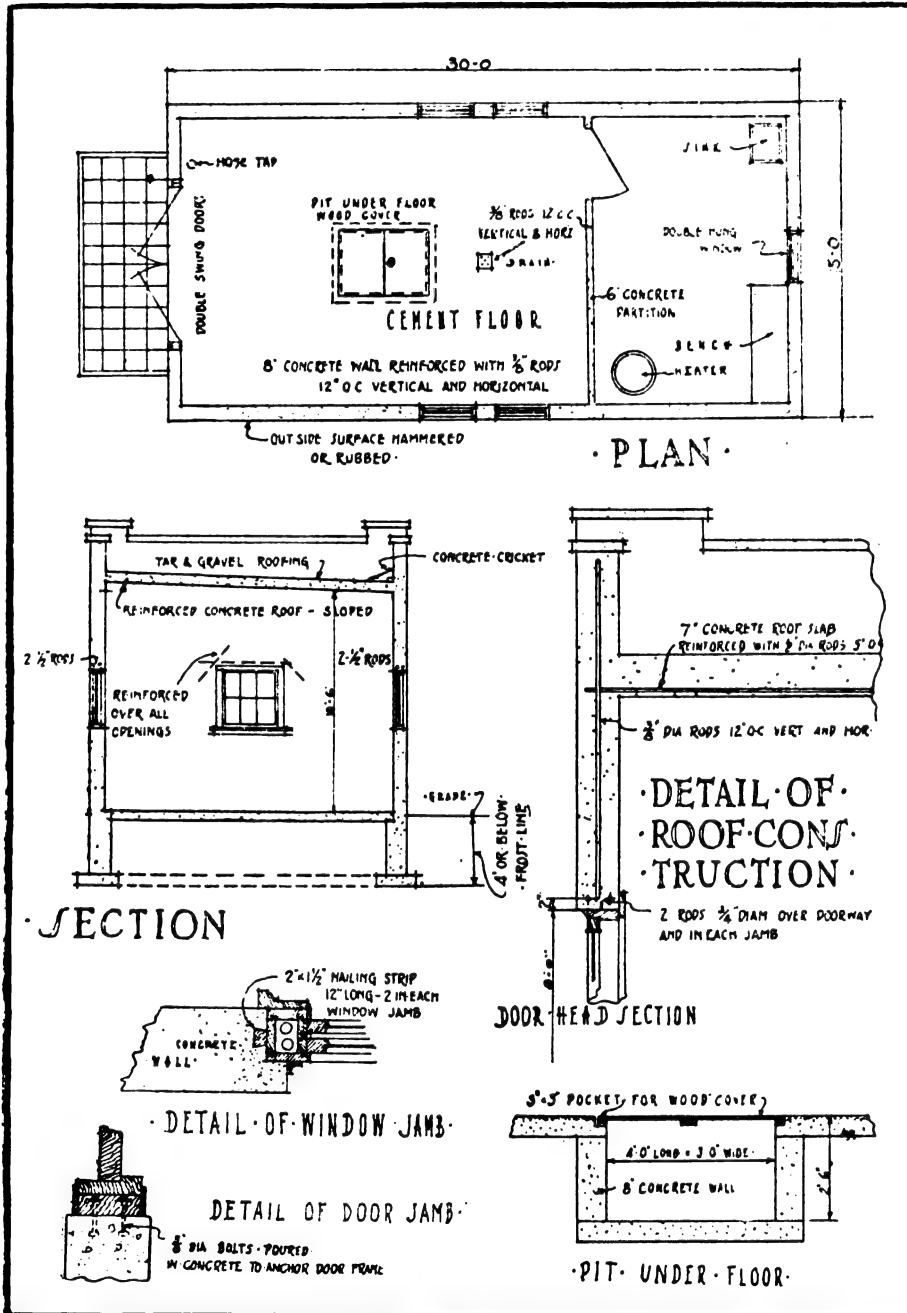
ing the floor and the pit walls cast, leaving a 3x3-inch pocket around the upper edges to accommodate a strong wooden cover. Holes for the drain and entrance of pipes should also be allowed for and the floor sloped gently toward the centre to carry off the water.

By paneling, or through the use of projections and recesses, some very beautiful effects may be obtained without much extra work. Mass concrete is treated in a number of different ways to

may be obtained by rubbing the walls with carborundum brick and washing down with clean water, after which cement grout may be added to give a smooth surface. A rough surface can be produced by scoring or scratching the surface with a sharp pointed tool or by removing the forms early and exposing the stone aggregate by taking off the outer surface with a weak solution of muriatic acid.

In extremely cold weather the materials for concrete should be heated up to a temperature of 80 degrees before mixing, and in the summer time after the mixture has been poured in the molds it should be covered up and after it has set liberal applications of fresh, clean water thrown onto it.

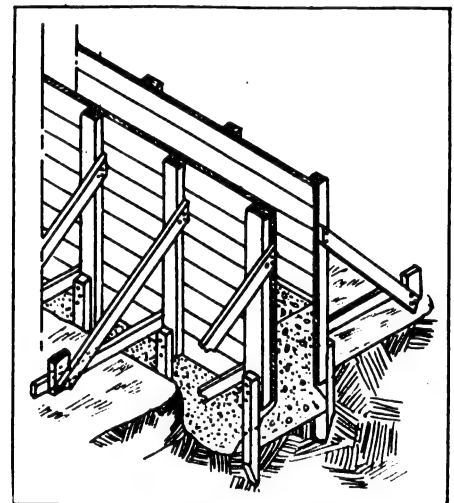
Before planting grass seed or resodding the lawn or ground about the building, which has been torn up by the building operations, the gasoline tank should be buried. They are usually placed about 3 feet underground with a pipe leading out of the bottom to the gasoline pump on the inside of the garage. A fine mesh wire screen should be placed in the neck of the filling pipe to prevent



Detailed Plans for Building a Mass or Reinforced Concrete Garage.

also described in detail in the previous number of The Automobile Journal, is similar in all garages. The ground should be well rolled or tamped and a four-inch base of concrete, laid one part cement, 2½ parts sand and 5 parts stone. A finishing layer of one part cement and two parts sand or grit should be laid on the base. If a pit is to be installed provision for it should be made before lay-

ing the floor and the pit walls cast, leaving a 3x3-inch pocket around the upper edges to accommodate a strong wooden cover. Holes for the drain and entrance of pipes should also be allowed for and the floor sloped gently toward the centre to carry off the water. The walls should be given a month's time at least to dry out if a stucco finish is to be applied. When the forms are first removed a pleasing finish



Method of Building the Foundations and Walls.

the entry of any foreign matter when the cap is removed for filling.

Electricity is the ideal form of illumination for a garage and in cases where the current cannot be obtained from a power company a system that can be attached to the electric lighting system on the automobile can be readily devised.

Running water and a sink are almost indispensable and hot water should be provided where the connections can be made with the hot water system of the house without too much trouble or expense, as it is quite frequently needed in the winter time in starting the engine and for washing after one has been tinkering around the machine.

The work bench is another piece of garage equipment that might be classed as a necessity. It should be provided with a substantial vise and a tool drawer.

AUGUST 25, 1916.



DISCO ELECTRIC SYSTEM.

In addition to making electric starting and lighting systems as standard equipment for 18 large American car manufacturers, the maker of the Disco systems, which include one-unit and two-unit types, is producing a special outfit for Ford cars. This system is a single unit, simple, light and compact, operating on a 12-volt current, which insures a start every time. Chain breakage is prevented and perfect alignment is maintained by the use of a special patented yoke bracket for a mounting. The system is easily accessible itself, and does not interfere with access to the Ford engine.

Manufactured by the Disco Electric Starter Corporation, Detroit, Mich. Write for prices.

VALVE SPRING REMOVER.

The Bryant valve spring remover is a universal ratchet tool that can be used in practically every make of motor, including the latest models with over head valves. It also can be used as a clamp to hold springs compressed securely during the operation of replacement.

Manufactured by Stevens & Co., 375 Broadway, New York City. List price, with key, \$1.50.

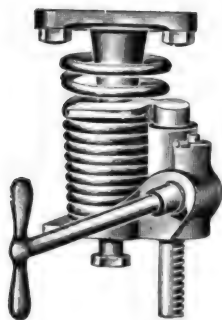
SIOUX VALVE GRINDER.

The Sioux valve grinder, illustrated herewith, is designed especially to meet the need for a simple, yet inexpensive tool for grinding valves. It is constructed of the best material and operates on ball bearings. By turning the handle continuously in the same direction the valve rotates back and forth on its seat. This motion is a trifle further in one direction than the other, thereby producing an accurate reciprocating motion, which is absolutely necessary for perfectly ground valves. The outfit, which includes all necessary driving points and large double can of valve grinding compound, is packed in a neat wooden box.

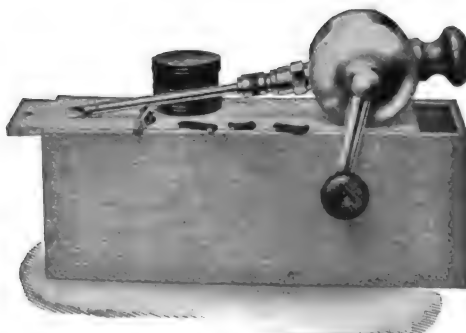
Manufactured by Albertson & Co., Sioux City, Ia. List price, \$7.
AUGUST 25, 1916.



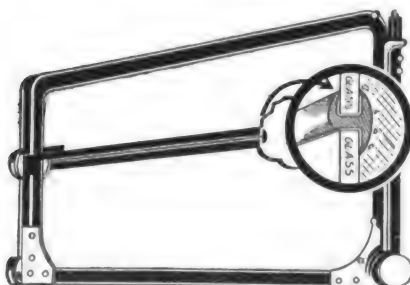
Disco Starting and Lighting System for Ford Cars.



Bryant Valve Spring Remover.



Sioux Valve Grinder and Case.



McCormick Weather Strip Fitted.

MCCORMICK WEATHER STRIP.

The McCormick weather strip is designed to fit the upper edge of glass on the lower section of a windshield, fitting tightly against the glass, thereby deflecting rain, hail and sleet over the strip so that the water will trickle to the ground. As the glass comes into a vertical position the single flange, or lip, is forced tight against the forward (outside) face of the upper glass, making the connection water tight between the panes. The strip is equally tight when placed with the lip on the inside, allowing the upper glass to swing freely. The weather strip is very easily adjusted by a light pressure of the thumb and is easy to remove and can be coiled and placed in the pocket on the car door. The device is guaranteed to give satisfaction.

Manufactured by the Robinson Manufacturing Company, Lincoln building, Louisville, Ky. Retail price, \$1.

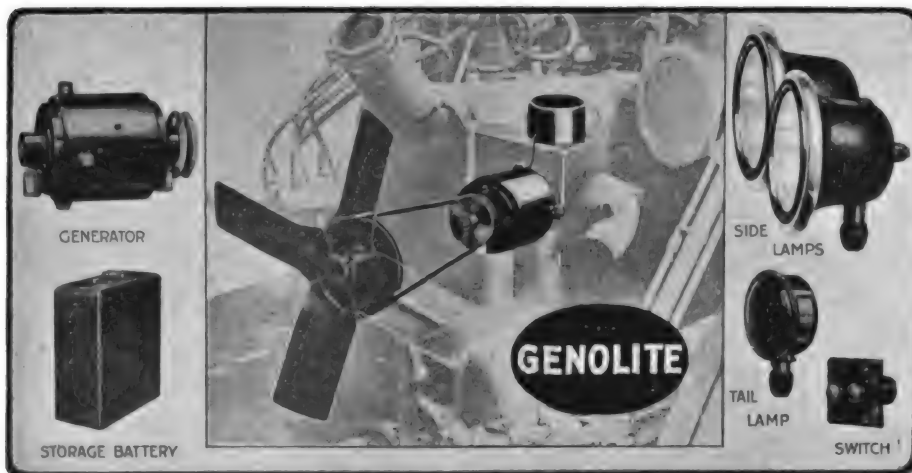
KORINE CARBON REMOVER.

Korine carbon remover is a fluid, made up after a secret formula, which is designed to clean a motor of all carbon encrustations more quickly, safely and satisfactorily than can be done by ordinary methods. It is intended to take the place of costly carbon burning outfits and has been in use for more than four years in some of the largest garages in the country. The maker guarantees that it will do all that is claimed for it and that the fluid is non-injurious to motor parts and that it is absolutely fireproof. It is put up in quart and half gallon quantities for car owners and in larger quantities for garage use.

Manufactured by the Korine Carbon Remover Company, Room 317, 136 Federal street, Boston, Mass. Retail price, quart, \$1; half gallon, \$1.75; gallon, \$3.00.

GENOLITE FOR FORDS.

Genolite consists of a complete lighting outfit for Ford cars and includes generator, automatic cut out, storage battery, control switch and lamps. The generator is conveniently attached, without machine work or the removal of the radiator, by means of a bracket, which engages the studs of the front water connection. The driving pulley is split,



The Units of the Genolite and How It is Installed.

so that it may be easily applied to the fan spindle. Drive is by a spiral steel belt, which maintains proper tension and is amply efficient for transmission of the small power required to generate the eight or 10 watts, which is maximum output.

The battery consists of a single cell of 40 amperes-hours capacity and is connected to the dynamo through an automatic cut out, which functions at a variable speed of 10 miles an hour, the battery carrying the light load below that speed and when the motor is not running.

The lamps supplied are black enamel, nickel trimmed, and are furnished with the necessary bulbs, and with sufficient wire to connect up the system. The Genolite can be fitted with very little trouble and at practically no expense beyond the initial cost of the outfit.

Manufactured by the Detroit Starter Company, Detroit, Mich. Price, \$19.85 f. o. b. Detroit, including all attachments.

DEMOUNTABLE WHEEL SET.

The Standard demountable wheel set is designed to equip the regular Ford car wheels so that the owner can change the wheel instead of the tire simply by loosening four bolts and replacing the wheel with a spare wheel on which a tire is already mounted. The set consists of four special steel plates that are attached to the insides of the wheels on the car, and the necessary bolts and an extra wheel. It is obvious that this arrangement simplifies the matter of changing tires and is a convenience that every Ford owner will appreciate.

Manufactured by the Standard Auto Accessory Company, Leipsic, O. List price for the set complete, \$12.

WOODWORTH TIRE ACCESSORIES.

Two of the several Woodworth tire accessories now on the market are shown on this page, a light strap tire boot and a steel studded tire cover, both of which are made of one-ply leather throughout its width, the leather having been water-proofed by the Woodworth process so



Woodworth Light Strap Boot, Above; at Left, Woodworth Tire Cover.

that they always remain flexible. The strap tire boot is designed for use on weak or blown out tires, and is made to be either hooked, laced or strapped on to the tire. It is studded on the wearing surface with steel studs.

The Woodworth tire cover is a steel studded protector that, placed on a tire, protects it from all external injury, lengthens its life and provides a non-skid that is always in place. These covers, as is the case with all Woodworth devices, do not, according to the positive



Master Spark Plugs.

assertion of the maker, deteriorate with age and are not injured by oil.

Manufactured by the Leather Tire Goods Company, Niagara Falls, N. Y., Write for prices.

MASTER SPARK PLUGS.

The highest achievement in spark plug construction is said to be incorporated in the Master calorite spark plugs. Their cores have ample provision for expansion and contraction and the manufacturer declares that they are unbreakable. A further guarantee against injury is that only the best grade of imported porcelain is used. A few qualities of the Master plugs which are worthy of mention are as follows: They will not carbonize or short circuit; they will always fire regardless of an over abundance of oil; they will produce a hot, fat spark on a weak circuit, and they will not leak compression. The plugs are adapted to all types of motors, including those used in racing cars. A generally accepted guarantee of their high merits is that the government has adopted them exclusively for the navy department.

Manufactured by the Hartford Machine Screw Company, 508 Capitol avenue, Hartford, Conn. List price of regular length plug \$1; extra length and Ford model, \$1.25 each.

NEW ACCESSORY CATALOGUE.

One of the most comprehensive books of reference on motor vehicle accessories published within recent years is the new Faw catalogue, which lists a very complete line of all standard motor car accessories. The book is thoroughly indexed on the back cover, this index serving as a ready reference to all the several important lines carried by the jobber and distributor. The catalogue is well laid out and printed and can be had upon request.

Distributed by J. H. Faw, Inc., 41 Warren street, New York City, and Atlanta, Ga.



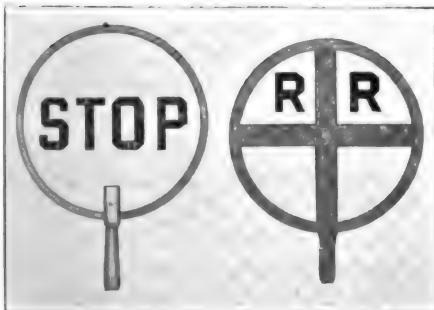
Demountable Wheel Set.

AUGUST 25, 1916.

NEW R. R. CROSSING WARNINGS.

Important Changes In Methods of Warning Motor Traffic Are Announced by B. & A.

The Boston & Albany railroad has adopted some changes in its system of signals to be erected at grade crossings as a warning to automobilists and other



At Left, the Flagmen's Signal; at Right, the Permanent Approach Warning Stop.

traffic. These new methods of protecting the grade crossings are in conformity with the recommendations made for the entire country at a meeting of a joint committee representing the National Association of Railway Commissioners and the American Railway Association. A new type of "approach warning signs" are the principal features of the new system. These are made in the form of circular metal discs, 24 inches in diameter, and are erected on poles along side of the highway 300 feet on either side of the crossings. The signs will have black markings on a white field as shown in cuts. They will be furnished free of charge to the cities and towns that will erect and maintain them.

The substitution of red lights for white lights at crossings for night use will be made and instead of flags the flagmen will have round metal discs made similar to the approach signs, only bearing the word "stop" in large letters on a white background. These have handles attached with which the flag man holds them out in a warning position. Crossing gates will be painted with alternate black and white stripes instead of plain white as at present. These stripes run diagonally after the fashion of a barber pole and give the barrier greater visibility than the plain white finish.

KING HIGH GEAR RECORD.

The eight-cylinder King has added several more high gear records to its long list of unusual trials with the shifting lever removed. A. F. Justin and a party of five in a seven-passenger King went from Providence, R. I., to Detroit and return without shifting from the high gear. Runs under similar conditions have also been made recently in the West.

SCRIPPS-BOOTH CATALOGUE.

The Scripps-Booth Company, Detroit, Mich., has issued a new catalogue of AUGUST 25, 1916.

unique and beautiful design. It is distinctly different from other automobile catalogues and is also an exceptionally fine product of the printer's art, embodying a new type of printing, illustrating and color work.

The reading matter is bright and interesting and tells the story of the Scripps-Booth from a new angle, without touching on the specifications which are printed on a separate insert leaf of fine grade water marked paper.



August.

Race (track), Kalamazoo.....Aug. 26
Demonstration (farm tractors), Indianapolis.....Aug. 28-Sept. 1

September.

Race (speedway), New York, Sheepshead Bay.....Sept. 1-2
Show, Cleveland, O.....Sept. 2-9
Show, Columbus, O.....Sept. 2-9
Race (track), Elmira, N. Y.....Sept. 4
Race (speedway), Des Moines....Sept. 4
Race (speedway), Cincinnati, O.....Sept. 4
Race (track), Newark, N. J.....Sept. 4
Race (track), Spokane, Wash..Sept. 4-5
Demonstration (farm tractors), Madison, Wis.....Sept. 4-8

Show, Hartford, Ct., Fair Ass'n..Sept. 4-8
Show, Indianapolis.....Sept. 4-11
Convention, Good Roads Congress, St. Paul, Minn.....Sept. 6-7
Show (accessories), Baltimore Sept. 6-29
Race (speedway), Indianapolis...Sept. 9
Show, Milwaukee.....Sept. 11-16
Race (speedway), Providence...Sept. 16
Race (track), N. Yakima, Wash..Sept. 18
Show, Oklahoma City.....Sept. 23-30
Show (state fair), Salem, Ore. Sept. 25-30
Race (track), Trenton, N. J....Sept. 29
Race (speedway), New York, Sheepshead Bay Speedway.....Sept. 30

October.

Convention, National Association Automobile Accessory Jobbers, St. Louis.....Oct. 2-5
Race (speedway), Omaha, Neb..Oct. 7
Race (speedway), Philadelphia..Oct. 7
Race (speedway), Chicago.....Oct. 14
Show, Dallas, Tex.....Oct. 14-31
Race (speedway), Indianapolis..Oct. 19
Race (track), Kalamazoo, Mich..Oct. 21
Tour, Commercial Car Reliability, Los Angeles.....Oct. 22-23

November.

Race, Vanderbilt Cup and Grand Prix, Santa Monica.....Nov. 16-18

January, 1917.

Show, New York City.....Jan. 6-13
Show, Montreal, Que.....Jan. 13-20
Show, Chicago.....Jan. 27-Feb. 3

February.

Show, Newark, N. J.....Feb. ..
Show, St. Louis, Mo.....Feb. ..
Show, Omaha, Neb.....Feb. 26-March 3



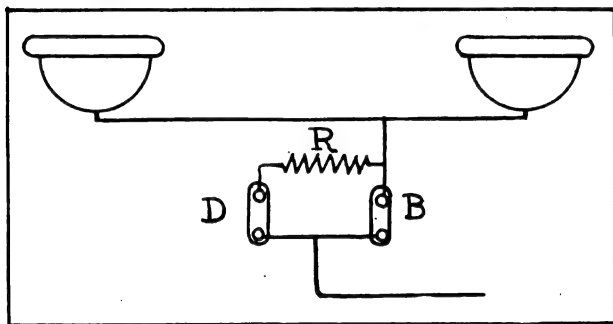
PATHFINDER FOR PREPAREDNESS.

In a Recent Preparedness Parade in Indianapolis, the Pathfinder Armored Car, as well as the Two Pathfinder Twelve-Cylinder Touring Cars, was a conspicuous attraction. The Cars were furnished by W. E. Stalnaker, Vice President of the Company. The War Car had a Gatling Gun, Firing 1000 Times a Minute.

MOTOR STARTING AND CAR LIGHTING.

The Absence of Any Gauge That Will Show Battery Capacity Instantly Leads to Abuses of the Battery and Consequent Faults and Failures of Systems.

IF THE car owner fully realized the real operating conditions of electric starting and lighting systems, and gave the attention that is ad-



Typical Arrangement of Switch Connections for a Resistance System for Dimming the Head Lamps.

vised, he could have admirable service, but because he has no indication of battery capacity in the same sense that a float gauge will indicate the volume of fuel in a tank, he will use the battery to such an extent that it cannot be supplied with current by the means of generating. This statement should not be understood as meaning that the generators or batteries are inadequate, for they are not. To charge a single cell normally will require the same length of time as would be necessary for charging 100 cells, and a discharge to be normal will require about the same period as for charging.

The generator is designed to supply current sufficient to carry the lamp load without drawing upon the battery, and, unless the car is idle and the engine stopped and the lamps lighted, there is no drain upon the cells, but the great fault is that the engine is too frequently started.

The ammeter will indicate the current that is being supplied to the battery and drawn from it by the lighting circuit, but it will not show the number of amperes in the battery at any given time. The battery may be fully charged or discharged, or in any state of charge between the two, but the ammeter will only show current flow. No instrument has ever been devised that will indicate the exact state of battery charge. An ampere hour meter will indicate how much current has been supplied to a battery, and how much is drawn from it through the main circuit in which it is connected, but it will not show the loss through voltage drop or any other cause for shrinkage in capacity. Neither will an ampere-hour meter indicate the losses in capacity from quick discharge.

What the Voltmeter Indicates.

The voltmeter will indicate the exact pressure of the current in the battery, and yet the

graduations of the scale are too small to be read with any degree of certainty so far as battery capacity is concerned. To illustrate: When charged to its fullest capacity a battery may show 2.55 or 2.60 volts a cell, and multiplying the voltage of three such cells by the number of cells would give a battery voltage of 7.65 or 7.80. Such indication might obtain at the conclusion of charging, but shortly after the conclusion of a charge the voltage will drop until it may be 2.20 a cell or 6.60 for the battery. When the battery has been drawn upon until the voltage is indicated as 5.10 or 1.70 a cell, the battery is discharged, and further use would result in heavy sulphation of the plates and possibly other deterioration.

There is, of course, probability that a battery may be damaged by overcharging, but where one is deteriorated by this abuse there are hundreds damaged by lack of charge. If the charging and discharging could be observed and understood, just as the owner can understand from a sight gauge, the operation of a lubricating system or the quantity of fuel in a tank, there would be comparatively few mistakes; there would be almost universal satisfaction and the repair and maintenance expense of the systems would be minimized. But this is impossible, despite the fact that practically every other form of protection is afforded the owners.

Not Many Voltmeters in Systems.

The majority of lighting systems do not include voltmeters, so that the driver must be governed by the indication of the ammeter, which is whether or not the battery is being charged in differing conditions. The expert battery man, with a hydrometer, can determine with very accurate results the condition of the battery as to capacity available, but this method cannot be resorted to by the owner or driver, even if expert

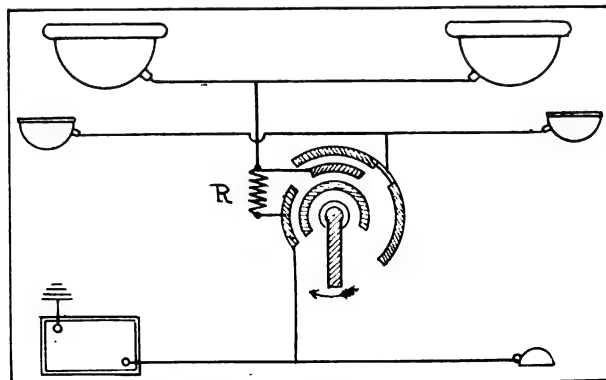


Diagram Illustrating the Construction of a Rotary Lighting Switch for Lighting System.

enough to take definite readings, for obvious reasons.

The small instruments that are not permanently installed in the car can be used for testing the circuits to determine both voltage and amperage in examination of the system, or tests may be made by means of an outside circuit, either one created by a battery of dry cells or a lighting circuit. But the dials of these need not be of large capacity. The principal purpose is to determine whether or not the circuits are intact. If the circuits are broken from some cause the aim is to learn this fact and search until the cause is found and then make restoration.

System of Wiring Easily Understood.

Where the circuit is well installed there ought to be no difficulty in following it, and, unless it has been tampered with, the connections ought to be the same as when installed. But when one purposes to work on some of the instruments and accessories for restoration there ought to be positive knowledge of what is required and how the work can best be done. Statement has been made that at least 90 per cent. of the troubles with a lighting and starting system result from the condition of the battery, and the battery can be tested through the circuits connected with it or by removing it from the car and working directly on the terminals.

The wiring of the circuits are comparatively simple after they are studied, but the construction of some of the units is more or less puzzling and may not be understood by those who assume to be expert. There are examples of design that are needless for the owner or driver to study, for few of them can ever expect to become sufficiently expert to deal with them. There would be no good purpose served, for instance, to go into the detail of construction of generators and motors, of instruments and accessories, unless practical results could be accomplished from a knowledge of them. As a matter of fact the best advice that can be given an owner is that when a machine or an accessory with which he is unfamiliar fails it should receive the attention of the maker.

Why Batteries Fail.

The reason that the battery is so much abused is that it is the source of all current utilized by the lamps and the motor, and because the motor requires so much power to start the engine. The larger the battery in point of ampere-hour capacity the better the results that can be obtained; but large batteries cost more money, the charging generators could not be increased in size to afford greater current supply without additional expense, and there is no assurance that owners, no matter what the equipment, would use more care in operating them.

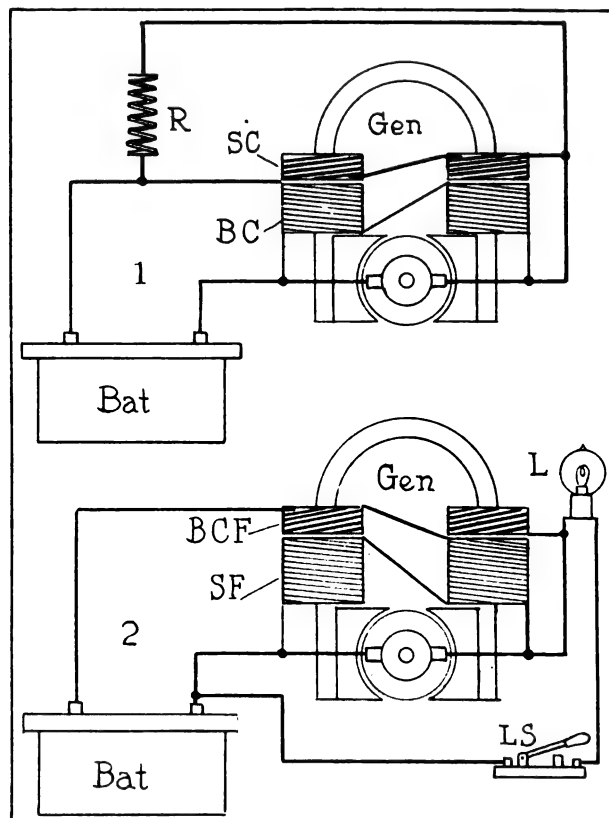
The same reasons will apply to the use of larger instruments for indicating purposes. The

cost to the owners would be increased and there would be no material benefits. If the owners will exercise reasonable discretion they will get on very well, but unless they are willing to do their part they will experience more or less of the inconveniences that obtain from faults and failures, and the maintenance of the systems will necessitate expense and vigilance.

(To Be Continued.)

ECONOMY OF WILLYS-KNIGHT.

R. C. Johnston of Waxahachie, Tex., reports a recent 2400-mile trip through the Rocky Mountain region in a Willys-Knight model 84-B, car-



Bucking Coil Controlling Current Output of the Bosch-Rushmore System: 1, R, Resistance; Gen., Generator; SC, Shunt Coil; BC, Bucking Coil in Series; 2, Bucking Coil Controlled Through Lamp Circuit; LS, Lighting Switch; L, Light; Gen., Generator; BCF, Bucking Coil Field; SF, Shunt Field.

rying a complete outfit and three passengers, at an average cost of two cents per mile for gallon. Only \$48 worth of gasoline and lubricating oil was purchased on the trip.

CHALMERS CARS DEFEND CANADA.

The department of militia and defense of Canada has placed an order for 20 3400 revolutions per minute Chalmers cars for the use of army officials. This is the second order given by the Canadian government for Chalmers cars. A previous request for 41 was delivered to the various concentration camps.

Graphic Items from the Fortnight's News

Miss Francis Howe, a co-ed of Standard university, is driving a Jackson touring car across country via the southern route and will make a tour of the large



cities of the Atlantic coast when she arrives in the East.

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The reason why motorists show a strong desire to have certain numbers on their plates is one for scientists to investigate. The Massachusetts authorities report a strong demand for number 1, 13 and 100,000. They are said to be thinking of adding a pathologist to the board.

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Automobilists who have been touring extensively this season are thinking seriously of studying the deaf and dumb system of signs as a possible means of interpreting the various gestures and signals made by the traffic officers in different cities. There is no uniform code



used by any of these crosswalk guardians apparently and the gyrations of their swinging arms often serve more to confuse the driver than to aid him.

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Henry Ford, among his other achievements, has established himself as the country's leading movie fan, recently paying \$1000 to witness one performance of a motion picture, "Civilization." The film was brought from Chicago to Detroit by special train for Mr. Ford's special benefit.

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Saddle horses are again coming into style, but command a considerably higher figure than when they were formerly in vogue. A perfectly stylish animal can be secured from \$1500 to \$3000. Motor

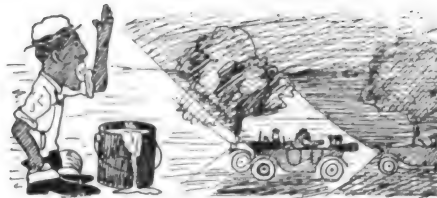


car manufacturers are not worrying with runabouts selling at almost one-tenth of the latter price.

R. W. Angell found himself between two masters when he ran down a man in Providence, R. I., recently, and his desire to obey the command of his father in preference to the "mighty hand of the law," cost him a fine of \$10 and costs. The Rhode Island law called for his remaining at the scene of the accident, but remembering that his father had instructed him to report to him immediately should such an incident happen, he drove to his home, with the result that he was fined by the court.

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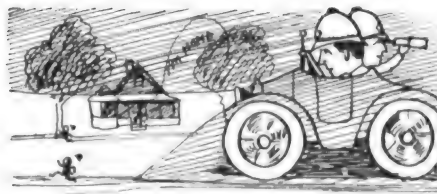
A good samaritan, with more or less of a business penchant, saved many automobilists from facing the judge in Montclair, N. J., on the charge of vio-



lating the new law regarding lighting dimmers. After witnessing a number of arrests for this "crime" the colored gentleman in question provided himself with a pot of kalsomine and brush. Stationing himself just above where the authorities were apprehending the violators of the law he hailed the approaching machines and after giving them due warning of what was in store for them, received a 50 cent contract to apply his dimming material to the headlight lenses.

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Through the use of an automobile the police of Lexington, Mass., have inaugurated a "round up" system of patrolling the city on Saturday nights when some of the citizens take particular joy in "painting the town red." The machine



patrols the streets from end to end with two officers, who invite said disturbers of the peace to take a ride to the police station.

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Irving Donahue, Washington, D. C., is said to have the only known carburetor museum in existence. His collection is not only large, but includes a wide line of American and foreign makes, modern and antiquated.

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A farmer in California, whose middle name is efficiency, or should be, has been using his automobile to pull his mowing machine and has cut as high as 20 acres of hay in one day. He also

used the machine for pulling the rake and stacking.

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Prof. Edward H. Forbush, the state



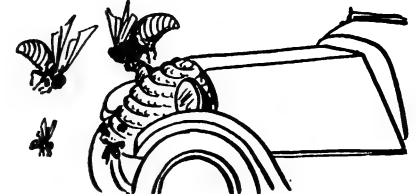
ethnologist of Massachusetts, says that automobilists are responsible for the death of a large number of birds. He claims that the birds in crossing the road after a rapidly moving machine lose their equilibrium in the air suction and before regaining it are run down by other machines.

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Automobilists generate considerable enthusiasm at times, but it seldom reaches that point of excitement that recently caused a Keene, N. H., man to kill his wife because she had been granted permission to operate his father's car, a privilege he had been denied.

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The sad fate of a swarm of bees mistaking an auto radiator for a hive, resulting in their cremation, does not



seem odd considering the great similarity of the two objects, but it is difficult to understand why such an incident has not happened before.

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Somnambulism is an old chestnut in medical nomenclature compared with the new terms being devised to apply to the persons who run automobiles in their sleep. It has not been agreed upon as yet, but when the matter is settled the name will be applied to an attack suffered recently by a Vermont man who, while in the arms of Morpheus, drove his car at a high rate of speed into a telegraph pole. The pole broke in halves.

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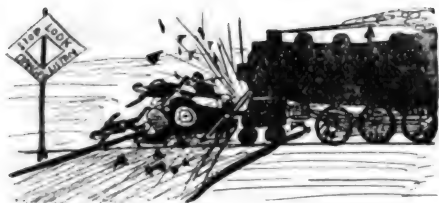
Henry Ford astonished the spectators at a recent tractor demonstrations in the West when he took the wheel of one of his latest creations, the Ford farm trac-



tor, and drove it across the fields to the accompaniment of the Ford factory Hawaiian quartette.

AUGUST 25, 1916.

Hardly a day passes but the press records the death or serious injury of a driver or member of a motoring party, due to reckless driving across a railroad

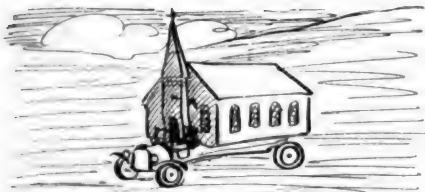


track ahead of a train. In 1915 nearly 1100 lives were lost in grade crossing accidents from this cause alone.

A demand for better roads in the Danish West Indies has been stimulated by the introduction of two motor cars on the island of St. Thomas. These machines, both low priced American makes, are hired by visitors to the island and are used at times for business purposes.

At the recent convention of the S. A. E., held aboard steamship on Lake Huron, a daily newspaper was issued, it containing the latest news items which were flashed by wireless to the boat from the wireless station of the Good-year Tire and Rubber Company's plant at Detroit.

The gospel motor 'bus has made its ap-



pearance in Kansas City, Mo. It is a used machine and was purchased at a bargain by the Rev. John E. Matthews, pastor of the Church of the Nazarene. The car is being used this summer to carry preachers and singers who will conduct services from it at street corners. The car will seat 15 persons.

Francis X. O'Brien of South Yarmouth, Mass., has adopted an unusual method of calling attention to the good roads movement. Instead of a powerful motor vehicle or other modern method of annihilating distance, O'Brien is using the original means of locomotion, namely, walking, in a trip from Philadelphia to Chicago, where he expects to finish on Oct. 13. The distance is 956 miles.

Recently a Denver KisselKar dealer received an order from a Gypsy band for

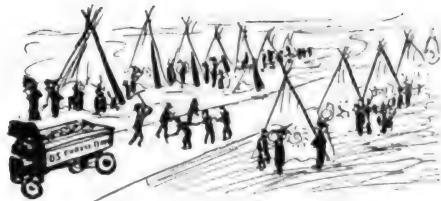


three second-hand cars, which were paid for with money that was green with age. These Nomads for centuries have traveled about with their horses, which furnished them the principal medium of a livelihood, and this is the first cases recorded where they have shown any desire to abandon this ancient method of travelling for the less picturesque automobile.

Up to Aug. 5 this year the automobile registrations in Maine totaled 27,028, as compared with 19,095 registered on the corresponding date in 1915.

The Waterville (Maine) Automobile Association was recently organized with Hon. Frank Reddington as president. Efforts will be made toward improving road conditions in the vicinity of Waterville and also to conduct a road advertising campaign to popularize the city.

The United States Forestry Service



plans the construction of a highway through the Fort Apache Indian reservation in Arizona, to connect Globe and Roosevelt with the National Old Trails highway. An Indian uprising is not expected.

Judge Thomas P. Riley of the Malden, Mass., court, has instituted a system of fines for speeding autoists under which the penalty is in accordance with the rate of speed. Autoists caught making 30 miles an hour are fined \$5 and a fine of \$10 is imposed for those making over that rate of speed and less than 35 miles, while those exceeding these limits will be punished proportionately.

The Automobile Club of North Lonup, Neb., recently offered five cents a pound for nails and screws picked up in the city's streets. School boys eagerly entered the campaign and netted 285



pounds of rusty metal, which was displayed in local store windows. The offer is still in force.

Black Hawk county, Ia., boasts of one automobile for every 13 of its residents. There are 3822 automobiles in the county and 53,469 residents. The value of the automobiles is estimated at \$3,822,000.

The Keokuk Automobile Club of Keokuk, Ia., has adopted an insignia in the form of a button, which the members will carry on their cars. It is distinctly original and striking. In the centre of a blue enamel circle on a two-inch disc of nickel is a brown enamel replica of

Chief Keokuk, for whom the club was named.

The prison labor commission of Pennsylvania was the lowest bidder for fur-



nishing license tags to the state highway department for 1917. Other bids were received from those who participated in former years, but the prison labor commission bid was five cents per tag lower than the next nearest.

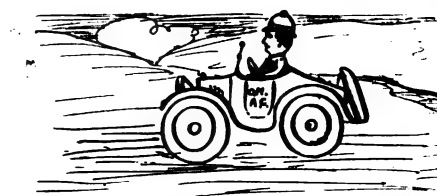
Recently a car driven by a young lady of Lawrenceburg, Mo., carromed off a cow in the road and went over a 30-foot embankment, breaking a telephone pole and crashing through a fence into a tree, where it careened onto its side without seriously injuring the occupants. The cow was less fortunate, being thrown by the first impact to a position where it acted as a buffer in retarding



the car's velocity against the fence.

Housing the automobile has become a serious problem in the large cities and has begun to engage the attention of large architects and real estate investors, some of whom have gone so far as to propose the erection of an automobile tenement with apartments for 1000 cars or more. These could be let at a comparatively nominal sum, compared with the present charges in large cities, and the building could be so arranged with elevators that the various apartments could be as easily reached in a machine as a person can reach an apartment in a hotel.

A special police officer, paid by the Omaha, Neb., Automobile Club, and distinctively uniformed so as to be readily recognized, is the latest idea of this pro-



gressive organization. The officer's duties are to trace stolen cars, hunt thieves and keep the club informed as to road conditions in and around Omaha.



When a Temporary Bridge Leading to Belle Isle, Outside of Detroit, Was Opened to the Public Recently, a Ross Eight, Driven by W. C. Hall, Led the Procession.

Snapshot Stories of Pleasure and in Several Lines



Possibly the Oldest Motorist in the World, Robert Doak, Carbondale, Penn., Who Bought an Overland 75 B to Celebrate His 93d Birthday.



The Trailblazing Chalmers Six, Which Piloted the National Parks Tour from the Twin Cities to the Yellowstone, Posing Before Old Faithful Geyser.



Incidents in the Official Army Test of the Armored Motor Car Company's Battle Car, Which Is Mounted on a King Eight Chassis: Upper Left, Reading Left to Right, Capt. W. A. Ross, Inventor; Capt. Earl Ellis, and Major A. F. Cased; Top Centre, Speeding Across Fort Myer Military Reservation at 45 Miles Per Hour; Upper Right, the Car; Lower Left, Straddling the "Black Ravine," a Four and One-Half Foot Ditch, During a Test Trip; Lower Right, Climbing Tortuous 500 Foot Sandhill at Fort Myer, the Road Being Studded with Boulders and Two-Foot Holes.

AUGUST 25, 1916.

of the Activities Commercial Cars of Employment.



International 2000-Pound Truck Descending Pike's Peak, Colorado, After Being Driven to the End of the Road Up That Mountain.



Motor Trucks, with a Series of Four Wheel Drive Machines in Front. Parked at the Military Base of the United States Army at Columbus, N. M. These Are Used to Transport Troops and Supplies.



Four Wheel Drive Truck Hauling Trains Loaded with Material for Road Construction on Industrial Railroad.



Signal Motor Truck, Decorated to Resemble an Armed Armored Battle Car, That Was a Feature of the "Preparedness" Parade at Seattle.



A Knox Four Wheel Tractor Recently Demonstrated the Economy of Such Transportation in the Mining Industry in Arizona in Operating Over an 18-Mile Road Between the Mine and Supply Station: (1) The Tractor on Jigger Hill, the Grade Some Times Exceeding 20 Per Cent.; (2) Crossing One of 64 Fords on the Route; (3) Tractor and Trailer Hauling 23,800-Pound Load Near Top of Rocky Hill; (4) at the Beginning of a 20 Per Cent. Grade Climb; (5) the 10-Mule Team and Wagon Used Before the Tractor Was Employed.

AUGUST 25, 1916.

PROSPERITY STILL CONTINUES.

Maxwell and Haynes Announce Dividends— Several Other Makers Report Big Earnings.

An initial dividend of 2½ per cent. on the common stock of the Maxwell Motor Company and a dividend of six per cent. on the second preferred has been declared, payable to stockholders of record Sept. 11. The dividend on the second preferred is payable in quarterly installments of 1½ per cent. The regular dividend of seven per cent. on the first preferred was also declared payable quarterly. The remaining first preferred dividend warrants outstanding will be paid in cash.

President Flanders, after the meeting, made the following statement: "We plan a production of 120,000 cars the coming season compared with 60,000 in the fiscal period just closed. Our sales in July totaled 8000 cars and August figures will be nearer 9000 cars.

"Our present facilities enable the production of the schedule of 120,000 cars and, in fact, lately our output reached 400 a day. Our dealers have already contracted for over 80,000 cars for the coming year. Our export business is increasing nicely. Cars exported during the past year totaled over 3000."

JUMP IN CHALMERS ASSETS.

The assets of the Chalmers Motor Company, according to preliminary statements covering this year's business, increased 50 per cent. as compared with last year. For the fiscal year ending June 30 the gain in the total assets was \$4,857,274, making the total now \$13,051,538.

The surplus on hand on that date was \$2,066,673.88, as compared with \$1,010,422 on the corresponding date in 1915, while the cash on hand showed a decrease of \$564,746, as against \$1,173,135 last year.

MAGNITUDE OF UNITED MOTORS.

The United Motors Corporation, the affiliation of the Dayton Engineering Laboratories, the Hyatt Roller Bearing, the New Departure Manufacturing, the Perlman Rim and the Remy Electric companies, has now reached an impressive magnitude, both in volume of business done and in manufacturing facilities. The corporation controls 110 buildings, with an aggregate floor space of 2,449,229 feet, equal to 56.3 acres. Employees number 14,000 and the number of assembled parts produced daily is 94,400, or an annual output of 28,320,000 parts.

The output may be classified as follows:

	Daily	Annually
Anti-friction bearings	65,000	19,500,000

Coaster brake hubs...	1,800	540,000
Starting, lighting and ignition systems...	1,150	345,000
Ignition systems only	1,450	435,000
Demountable rims...	25,000	7,500,000

The United Motors Corporation serves 10,318 companies and every motor car in use is equipped with one or more of its products. The corporation has 50 sales and service stations throughout the country.

CUSHION WHEELS POPULAR.

The business of the Sewell Cushion Wheel Company during the first quarter of their fiscal year showed an increase of 300 per cent. as compared with the same period last year.

Having developed a big demand for the Sewell Cushion Wheel, the manufacturers to further extend its value to users are planning a series of service stations in the important cities of the country, where the wheels can be put on and repaired. These service stations, it is understood, will be established in connection with the branches at Buffalo, New York City, Philadelphia, Baltimore, Minneapolis, Rochester, Cleveland, St. Louis, Pittsburg, Los Angeles, Seattle and Chicago.

FISHER BODY SELLS STOCK.

The Fisher Body Corporation, Detroit, the largest automobile body manufacturers in the world, has made arrangements with New York bankers to take \$5,000,000 seven per cent. preferred stock and part of the common shares of the corporation.

The Fisher Body Corporation is a consolidation of the Fisher Body Company and the Fisher Closed Body Company of Detroit, and the Fisher Body Company of Canada, Ltd. The concern makes bodies for Ford, Cadillac, Buick, Maxwell, Chalmers, Hudson and a number of other cars.

HAYNES STOCK DIVIDEND.

A stock dividend of 108 per cent. and authorization to increase the capital of the Haynes Automobile Company, Kokomo, Ind., from \$1,400,000 to \$4,000,000, have been declared by the stockholders of the concern. A new factory is to be started immediately, to be used almost entirely for quantity production of a new Haynes light six, the price of which will be about \$1000. Thirty-two acres of land near the present plant have been purchased for the new building.

The annual report of the company shows net earnings for the fiscal year to have reached \$1,600,000 on sales of 6700

cars. For the coming year an output of 12,000 cars is planned, 3000 of which will be the new Haynes twelves and the remainder light sixes.

The following have been re-elected to office: Elwood Haynes, president; Stephen Tudor, secretary; A. E. Starbuck, treasurer; A. G. Seiberling, general manager.

REDDEN INCREASES CAPITAL.

Incorporated little more than five months ago, the Redden Motor Truck Company, Detroit, has been compelled by the rapid expansion of its business, which is the production of the Redden Truck Maker, to increase the capital to \$500,000 to provide for further expansion of the plant and greater freedom of operations. The reorganization involves no material change in management or policy.

The Redden Truck Maker is for converting Ford cars into one-ton trucks.

JOIN MOTOR AND ACCESSORY MFRS.

The Rich Tool Company, manufacturer of engine valves and miscellaneous metal specialties, has been elected to membership in the Motor and Accessory Manufacturers, New York City.

Ford Produces 533,921 Cars.

Expectations of Officials Were Exceeded.
Year's Gross Business Reached
About \$20,000,000.

The Ford Motor Company exceeded its expectations of half a million Fords for the fiscal year ending July 31, it manufacturing in that period 533,921 cars. In 1915 the Ford factory turned out 308,213 cars, over a quarter of a million less than this year's production.

The average daily production during the 296 actual working days was 1816 cars, as compared with 1027 cars daily in the preceding year. The highest production was on Feb. 29, when 2430 cars were manufactured and shipped.

The Ford company since it started in business has manufactured over 1,450,000 cars, and this year's production in money represents a gross business of upward of \$200,000,000. It is understood that preparations have already been made for nearly doubling the output during the current year and it is also reported that a further reduction in the price would be announced at the end of next year.

The Ford Motor Company will abandon the branches of the main factory that are being maintained now in 51 cities. The business hereafter in these cities will be handled by individual dealers, who will maintain repair and garage facilities.

AUGUST 25, 1916.

This announcement was made after the officials of the company had decided that it would not be practical to maintain garage and repair facilities in all the cities, although they remain of the opinion that such service for Ford owners will not only be a very good feature for owners, but would also help to stimulate sales.

LEE COMPANY EXPANDING.

Because of the greatly increased volume of business in its puncture proof pneumatic tires, the Lee Tire and Rubber Company has been compelled to add another building to its plant at Conshohocken, Penn. The new structure will house on the general floor the necessary large dripping tanks used in the manufacture of rubber gloves, etc., and thus provide more room in the other buildings for the expansion of tire manufacturing facilities. Another object in view is to erect a separate building somewhat removed from the others so as to overcome the serious fire menace created by the gasoline laden atmosphere around the dripping tanks.

The new building will measure 80 by 120 feet and will be for the present two stories high. The design allows for more stories in the future. The walls will be of brick and the floors of reinforced concrete. Steel sash will be used in the windows.

Maker of Enger Cars Expanding.

Capital Enlarged to \$4,000,000 and Improvements Announced to Increase Production Materially.

Recently enlarging its capitalization to \$4,000,000, the Enger Motor Car Company, Cincinnati, O., is now prepared to enter upon a more extensive manufacturing career than it experienced even when Frank J. Enger was the sole owner of the company. Improvements in the plant are to be made immediately, they to afford facilities for the production of 7500 Enger cars during the coming year.

The stock of the new company is divided into \$1,000,000 convertible seven per cent. cumulative preferred and \$3,000,000 in common, of \$10 par value, of which \$1,000,000 will be reserved for the conversion of the preferred, which is to be convertible at the option of the holder any time before Jan. 1, 1918, and thereafter at the option of the company at 120 and accrued dividends. The present plant has been taken over by the company free of all incumbrances. Stock is being offered on a basis of one share of preferred and two of common for \$105.

The affairs of the company will continue in charge of Frank J. Enger as president, and Edward L. Jones as engineer and general manager. A number of Ohio bankers are understood to be interested in the company.

AUGUST 25, 1916.

SIMPLEX MAKES AERO MOTORS.

Details of Merger Plans, and News Concerning Prominent Men in the Industry.

The first big consolidation of aeroplane manufacturers has been announced in the merger of the Wright Company, the Simplex Automobile Company and the Glen L. Martin Company of Los Angeles, Cal., which will be known as the Wright-Martin Aircraft Corporation and will have \$5,000,000 seven per cent. cumulative preferred stock and 500,000 shares of common of no par value.

In addition to the Wright patents the new concern has the rights on the latest French patents in this country which have made the French machines the most successful in the European war operations.

The Simplex company was acquired to build the new motor that will be used, the Hispano-Suiza, which develops 150 horsepower with a weight of but 363 pounds. The Simplex plant at New Brunswick, N. J., has been enlarged and in addition to manufacturing the aeroplane engines will also continue the production of the Crane-Simplex.

GADABOUT CHANGES NAME.

Interests formerly behind the Gadabout Motor Corporation, Newark, N. J., and Detroit, have formed the Heseltine Motor Corporation. The stock is seven per cent. cumulative preferred with no par value. The officials have been investigating Buffalo, N. Y., as a location for its manufacturing plant, and has opened sales rooms at 2000 Broadway, New York City, and has two models of the car on exhibition. The company plans to have 1917 models ready in about two months.

MIDGELY LEAVES TIRE COMPANY.

Thomas Midgely has resigned as general manager of the Midgely Tire and Rubber Company, Lancaster, O., to become manager of the Interlock Core Company at Columbus. Mr. Midgely is one of the commanding figures in the tire industry, his career dating back over a number of years. He was at one time manager and vice president of the Hartford Rubber Company.

WAHLBERG WITH NASH.

N. E. Wahlberg has resigned the position of chief engineer of the Oakland Motor Car Company, Pontiac, Mich., to go in the same capacity to the Nash Motors Company, Kenosha, Wis., which took over the Thomas B. Jeffery Company. This change brings Wahlberg in association with his old chief, Charles N. Nash.

REPUBLIC ENGINEER GOES ABROAD.

Cecil Hamelin Taylor, consulting engineer for the Republic Motor Truck

Company, as well as for the Curtiss Aeroplane Company, recently sailed for France and England to confer with engineers of those countries and to investigate truck performance and aeronautical developments among the warring nations.

HENDERSON LEAVES COLE.

R. P. Henderson has resigned from the Cole Motor Car Company, Indianapolis, and has assumed charge of the management and sales for the Parry Manufacturing Company of the same city. The Parry company for some time has been producing automobiles as well as horse drawn vehicles, and is understood now to be planning an expansion of its motor car output.

JONES WITH FEDERAL BRASS.

Lloyd P. Jones, formerly with the American Bronze Company and since 1913 that company's manager of its western branch, has become sales manager of the Federal Brass Works, Detroit, manufacturer of Zephyr carburetors, bronze castings and bushings and babbitt lined bronze backed bushings.

SALES OF LIBERTY SIXES.

The Liberty Motor Car Company, Detroit, Mich., manufacturer of the Liberty Six, reports sales of more than \$3,500,000 worth of these models since the new car was announced.

Percy Owen, president of the Liberty Company, announces the appointment of the Pacific Motor Car Corporation of Los Angeles and San Francisco as distributors for the Pacific coast and also the establishment of agencies as follows: William Warnock at Sioux City, Iowa and Sioux Falls, S. D.; Abbott Automobile Company, Ltd., New Orleans; Central-West Motor Car Company, Columbus, O. Agency rights for Baltimore, Buffalo, Rochester and Reading, Penn., have also been closed.

The New York agency, the Colonial Motors, Inc., had a large crowd present on the opening day, as did also the Strassburg-Miller Company, Detroit distributors. Negotiations are also under way for agencies at Pittsburg, Cleveland, Minneapolis, Milwaukee, Toledo, Grand Rapids and Bay City, Mich., and a number of other large distributing points.

J. H. O'Brien, who resigned as assistant general manager of the Regal Motor Car Company on Aug. 1, has become associated with Charles G. McCutchen, president of the Ross Automobile Company, whom he will assist in the development of a tractor.

OVERLAND INCREASES CAPITAL.

Details of the Plan, and Other Important News of Financial Activities.

The Willys-Overland Company, Toledo, O., has disposed of \$15,000,000 of its treasury stock to J. S. Bache & Co. and C. D. Barney & Co. of New York City, thereby increasing its outstanding capital stock from \$22,500,000 to \$37,500,000. The stock sold was part of the common shares in the company and \$7,500,000 of the issue has already been sold, the remainder to be underwritten. Holders of the new issue as of March 15, 1917, will receive a dividend of five per cent. on April 2.

The present common stockholders of the Willys-Overland Company are entitled to subscribe to the new issue at \$44 a share on the basis of two-thirds of a share for each share held. The holders of the \$15,000,000 seven per cent. preferred stock outstanding have been given the opportunity to subscribe for one share at \$25 par value for each share of preferred stock held. This offering to the preferred stockholders was made possible by Mr. Willys waiving his right to some stock which he had a right to subscribe for.

The 10 per cent. common stock dividend declared in July last is payable in two installments of five per cent. each Oct. 2 of this year and on April 2, 1917. The new issue of common does not share in the October disbursement, consequently the new stock is worth approximately \$2.50 less than the shares of that class outstanding.

The company will have about \$15,000,000 in cash and \$30,000,000 of other quick assets when the receipts from the new issue have reached the treasury.

L. P. C. PAYS 100 PER CENT.

The creditors of the L. P. C. Motor Company, Racine, Wis., have been paid 100 per cent. of their claims in accordance with the promise made by Capt. William Mitchell Lewis, who was the main factor in the concern. At the time the company made a voluntary assignment, about a year ago, Capt. Lewis, who was at one time president of the Mitchell-Lewis Motor Company, gave his word that all the creditors of the concern would be paid in full if he had to meet the difference between the value of the liquidated assets and the creditors' claims. The sale of assets only realized 23.7 per cent. for creditors and Capt. Lewis made good his word by giving the referee a personal check for the difference, or about 76.3 per cent.

BONUS FOR EMPLOYEES.

The employees of the Saxon Motor Car Corporation, Detroit, will receive a bonus based on their yearly salary. This action was taken by the directors as a means of showing the employees that their

services were appreciated and to encourage them in interesting themselves in their work.

A bonus of five per cent. of the yearly salaries will be given each of the office employees and the factory hands will receive a bonus of three per cent.

It is stated that the Saxon company has already closed contracts with dealers for 50,755 cars for this season and that the management expects to turn out over 60,000.

CHEVROLET HAS \$25,000,000.

The Chevrolet Motor Company of New York City, according to a statement sent to stockholders and signed by President William C. Durant, has in its treasury over \$25,000,000 in cash and securities. The value of the plants, real estate, machinery, material, contracts, patents, good will, etc., are not included in this surplus.

NASH MOTORS FINANCING.

The financing plan of the Nash Motors Company, which was recently formed to take over the Thomas B. Jeffery Company plant at Kenosha, Wis., includes a liberal provision for future extension and expansion. Of the \$29,995,500 capital stock \$15,000,000 is set aside for the "purpose of acquiring properties along similar lines should the management so desire."

There is also \$5,000,000 in preferred stock and 50,000 shares of common of no par value. The issue of preferred stock, which is non-voting seven per cent. accumulative, has been sold, together with 12,500 shares of the common. Lee, Higginson & Co. of Boston, who acted as purchasers of the Jeffery Company, with Charles W. Nash, made the offering privately on the basis of four shares of preferred and one share of common stock at \$400. The offering was oversubscribed.

The preferred shares may be called by the company at its option as a whole at 105 any time before Nov. 1, 1920, and at \$110 any time following that date. Beginning in 1920 a sinking fund of two per cent. of the amount of preferred stock issued will be reserved from the profits.

Between Oct. 1, 1902, and May 31, 1916, the gross sales of the company were over \$53,000,000, with net profits of over \$7,000,000 after deducting \$1,660,600 for depreciation. Dividends of \$2,327,800 were paid out of the earnings, the remainder being reinvested in the plant and business. A statement of the company's financial standing as of May 31, 1916, shown by a tentative balance sheet, gives the following figures: Real estate, plants and equipment, \$2,962,000; other investments, \$242,000; cash, \$573,900; accounts

and notes receivable, less reserves, \$654,000; cars, work in process, materials, parts and supplies, less reserves, \$3,037,000; deferred charges to future operations, \$52,000; total assets, \$7,412,600, after deducting \$692,000 for current and accrued liabilities.

U. S. M. T. INCREASES STOCK.

At the annual meeting of the stockholders of the United States Motor Truck Company of Cincinnati, O., an increase in the capitalization from \$300,000 to \$1,000,000 was authorized. The new issue will be divided into both preferred and common stock and the preferred class, which is cumulative seven per cent., will share in the earnings with the common up to 10 per cent. The stockholders subscribed for a large amount of the new stock at the meeting and the remainder will be offered to the public.

The United States Motor Truck Company was established seven years ago. It was reorganized and the capital stock increased to \$300,000 in 1914 when R. C. Stewart was made president. Under Mr. Stewart's management the company has made remarkable strides in the truck industry to a position among the leaders, this increase in business being especially rapid during the past 18 months.

The report for the past year showed a large increase in sales and production and the increase in capital was made necessary by this enormous expansion in the concern's business, which became particularly marked during the past six months.

At the meeting of the directors the regular annual dividend of seven per cent. on the preferred stock was authorized and a considerable sum placed to the credit of the surplus.

ABBOTT CORPORATION.

The Abbott Corporation, with a capital of \$1,250,000, has been organized from the Consolidated Car Company of Detroit, Mich., which manufactured the Abbott-Detroit cars. The manufacturing plant and business offices will be removed to Cleveland, O.

A factory has already been secured in Cleveland which will enable an increased production and a better labor and materials market. F. C. Hull and A. W. Gardiner of Detroit, large stockholders in the Abbott Corporation, have interests in Cleveland, a fact which is understood was partially responsible for moving the plant.

The same men will continue to manage the company's affairs, with the exception of President C. L. Lewis, who recently resigned to organize the General Engineering Company, which will manufacture the new Doble steam car.

Morris Metcalf has been elected a director and vice president of the Simplex Automobile Company and will have charge of all the commercial departments, including sales, body, service and publicity.

AUGUST 25, 1916.

SUGGESTIONS FOR THE FORD CAR OWNER.

Disassembling the Rear Axle and Its Components—Determining the Condition of the Bearings and Gears and the Practical Means of Restoring Them.

The 54th article dealing with the operation, construction, maintenance, care and repair of the model T Ford chassis is the 15th of the series devoted to adjusting, restoration and overhauling.

BECAUSE the braking system of the car will be considered to material length in a succeeding installment, it will not be taken up in this article, which will have to do with the rear axle exclusively. The driving shaft complete and the wheels and brake drums having been removed from the assembly, this leaves the axle housing and the members it contains, which is in effect a double series of parts that are utilized to make up the right and left sides of the axle.

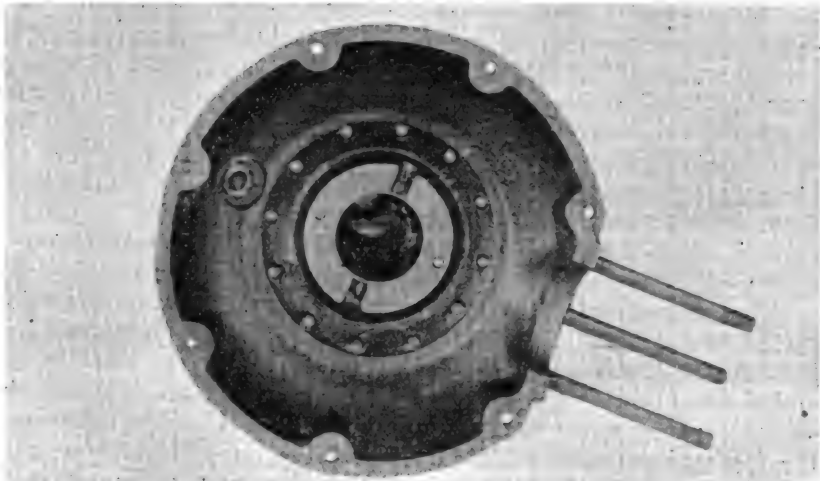
When the axle is built at the factory all the parts are new and have been passed by the inspectors as perfect, so that when the assembly is made there is no uncertainty of the relations of each to the other and the axle ought to be thoroughly efficient when it is assembled with the chassis. But after the machine has been used for a considerable period the wear and stresses to which the driving system of the vehicle is subjected will possibly result in conditions that especially require attention if the efficiency of the car is to be preserved.

The axle housing is divided in the centre and each half consists of three sections, there being two of each part in the casing or shell, as it is seen by the observer. In larger and higher-priced vehicles the axle housings are differently constructed, some being steel castings, and others formed from pressing steel, the purpose being to have them one piece, if possible, because of the assumed greater strength and the greater dependability from an engineering point of view. When the housings are castings, either one-piece or sectional, provision must be made for access to the differential gearset and its assembly, which is usually by inspection or cover plates that are removable and which are sufficiently large so that cleaning and adjusting may be done without disassembling the axle or removing it from the chassis.

Economy Impels Axle Design.

This form of construction is in itself very desirable because of the convenience in making ex-

amination, adjustment or repair, but it is much more costly than the sectional case, and for that reason cannot be considered as desirable from the viewpoint of the manufacturer of the low priced vehicle. Again, the one-piece housing is heavier, and as increased weight necessarily entails greater fuel consumption, there is a constant advantage obtaining with the lighter type, although it may not appear as slightly and it may not be as satisfactory in the event of repairing or adjusting. But there was due consideration of the advantages and disadvantages of the design before it was adopted for quantity production, and there was abundant reason to adopt what differed with types that may be approved by the builders and owners of more expensive machines. And yet, where there is no other factor, the dif-

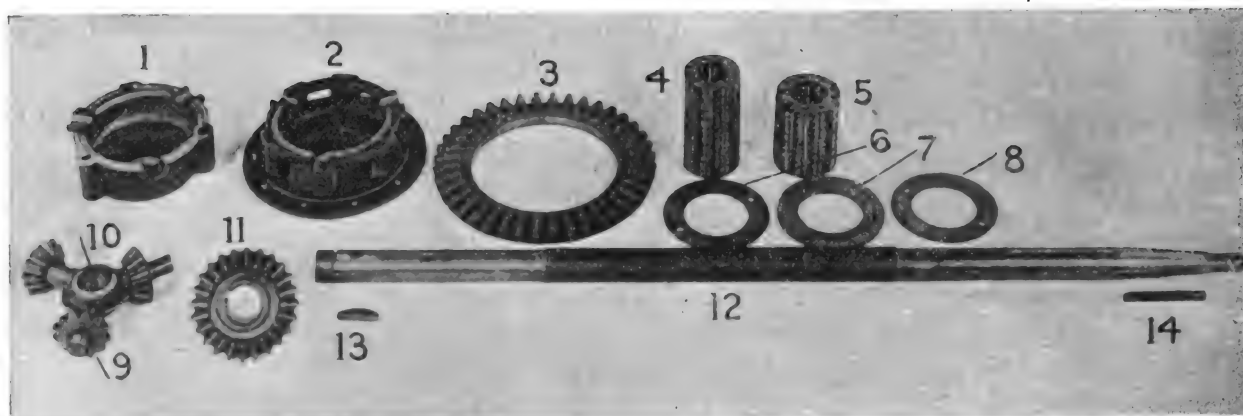


The Interior of the Central Section or Differential Housing of a Ford Rear Axle, Showing the Seat for the Bearing of the Inner End of the Driving Shaft.

ference in cost may be accepted as being compensation for the comparatively slight degree of labor that will be necessary on the average rear axle.

The axle housing consists of six pieces, there being two central sections that enclose the differential gearset assembly, two tubes that carry the driving shafts, and two flanges that are installed on the outer ends of the tubes and which carry the brake shoes and the radius rod ends, as well as the perches that support the rear suspension spring. Because of economy in manufacturing and to obtain lightness the housing was made sectional, and the central sections and the brake flanges are steel castings and the tubes are drawn steel.

The inner ends of the tubes are somewhat



The Differential Gearset, Driving Axle and Shaft Bearings.

- | | | |
|---------------------------------|-----------------------------|------------------------|
| 1—Differential Gear Case | 3—Differential Master Gear | 5—Inner Shaft Bearing. |
| 2—Differential Gear Case Spider | 4—Differential Thrust Ring. | 6—Driving Shaft. |
| | 7—Outer Shaft Bearing. | |

larger than the outer ends and the diameter is gradually decreased from the differential housing to the brake flanges. The central sections are securely riveted to the large ends of the tubes by series of 12 rivets spaced equi-distant, the ends of the tubes being flanged and the castings machined to form seats for the flanges. When the assembly is made the job is neat and the unit is substantial when the machines are not overloaded. The heads of the rivets are inside the housing. The brake flanges are steel castings that are bored accurately and the outer ends of the axle tubes are fitted into these bores and riveted securely, because there is considerable strain on them from the spring and braking stresses, and there is need of sufficient strength to insure endurance.

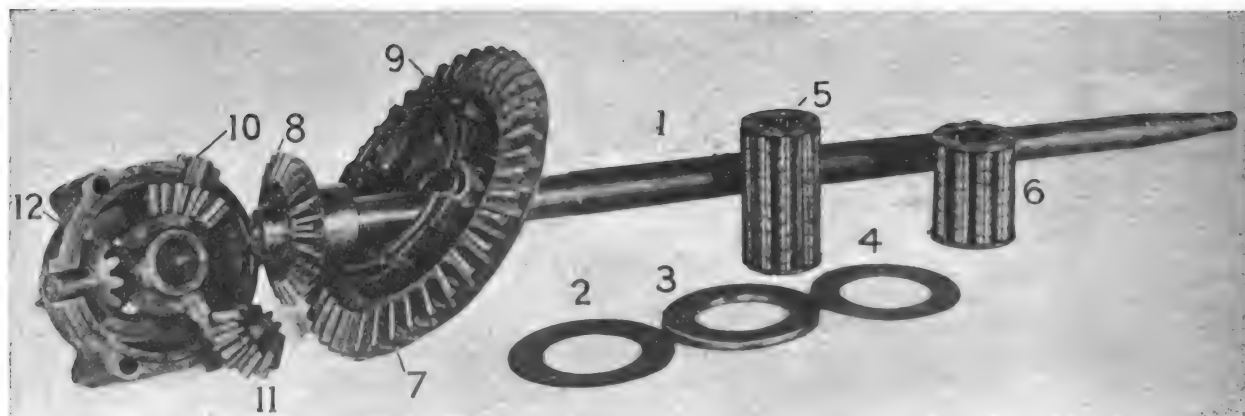
The central sections bell from the axle tubes to the centres, and the castings are formed so that there are flanges at the greatest diameters, and these are reinforced by seven internal bosses, equally spaced about the circumference. When the faces of the sections are machined the purpose is that they contact exactly, the bosses registering precisely with each other. These bosses

are bored for the seven bolts by which the two sections are secured together. The forward side of the section is somewhat heavier than are the others, for in this cut a semi-circular opening for the pinion of the driving shaft, and about the edges of this opening are mounted three studs, to which the bearing housing of the driving shaft is secured by nuts. These studs are threaded into the casting and are sufficiently heavy to endure all strains without bending.

Sections Are Rights and Lefts.

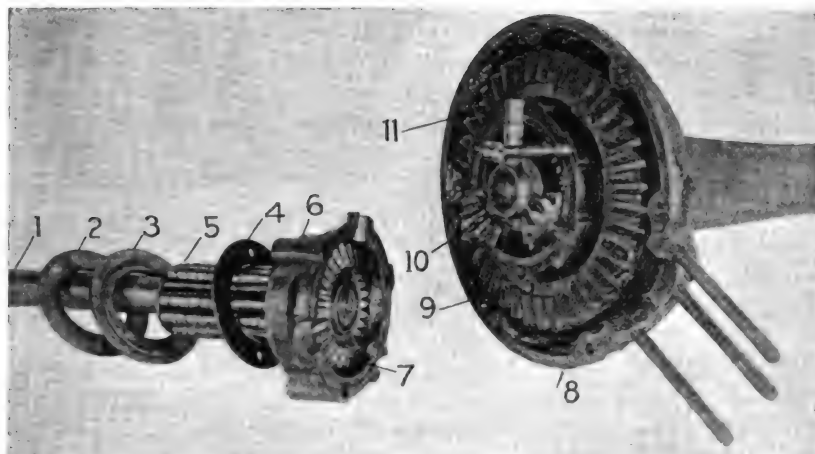
As may be assumed, the central sections are made "rights" and "lefts," because they cannot be made alike, yet these are interchangeable with similar parts of chassis of the same type. The brake flanges are also made "rights" and "lefts" and these must have as precise installation as the central sections, because they are only interchangeable in the same manner.

The statement made with reference to the central sections of the axle housing apply to the Ford chassis of recent construction, because in these the seats for the inner shaft bearings are machined in the castings, but in the older axles the bearing seats are steel stampings that are



The Differential Gearset and Driving Shaft Assembly Disassembled to Show Components.

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|-----------------------|-----------------------------|---------------------------------|
| 1—Driving Shaft. | 5—Inner Shaft Bearing. | 9—Differential Spider. |
| 2—Inner Thrust Ring. | 6—Outer Shaft Bearing | 10—Differential Pinion Carrier. |
| 3—Middle Thrust Ring. | 7—Differential Master Gear. | 11—Differential Pinion. |
| 4—Outer Thrust Ring. | 8—Differential Gear. | 12—Differential Gear Case. |



Left Half of Rear Axle and the Components Assembled but Not Secured.

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|---------------------------|----------------------------------|
| 1—Driving Shaft. | 7—Differential Gear. |
| 2—Outer Thrust Ring. | 8—Axle Housing, Central Section. |
| 3—Middle Thrust Ring. | 9—Differential Spider. |
| 4—Inner Thrust Ring. | 10—Differential Pinion. |
| 5—Inner Shaft Bearing. | 11—Master Gear. |
| 6—Differential Gear Case. | |

fitted into the casting and riveted into place and retained by the same series of rivets that secure the axle tubes to the central sections or castings.

When the housing is disassembled the axle must be removed from the chassis and the seven bolts that hold the two sections of the differential housing are taken out by loosening the nuts and withdrawing them from the bosses. When this has been done the halves of the axle can be drawn back and the shafts and the differential gearset will be found another assembly within them. When the halves of the housing have been separated, the inner and outer shaft bearings will be found secured in them, but all of the other components will be included in the shaft and gearset assembly.

How the Bearing Sleeves Are Retained.

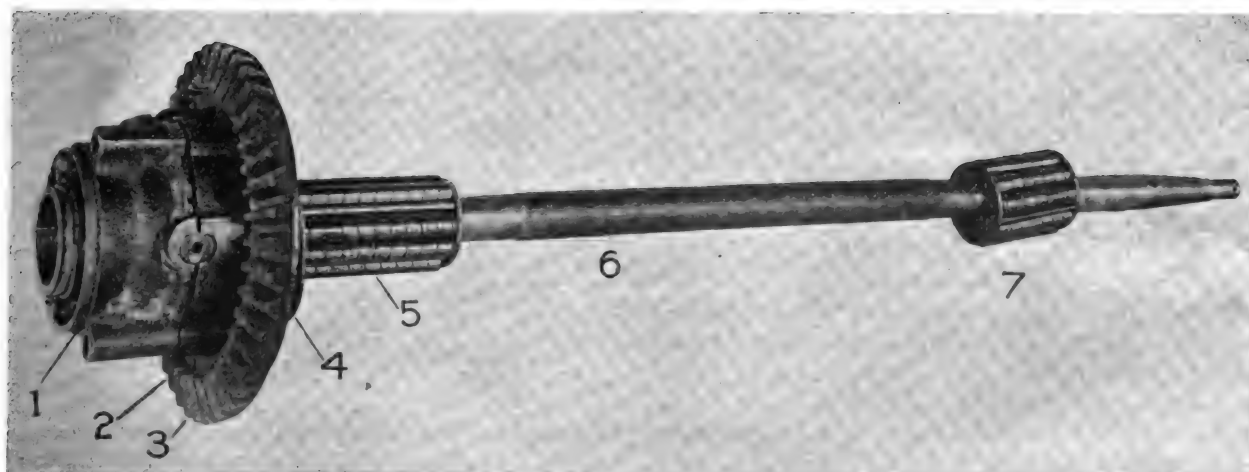
The bearings are retained in the axle housing by the sleeves, from which the roller sections can be easily withdrawn, but the removal of the

bearing sleeves is hardly practical without destroying them. The sleeves are made larger than the seats in which they are placed—that is, the sleeves are split and slightly expanded, so that they may be compressed to exactly fit the roller assembly. There are small lips, that are practically punch marks, on the exteriors of the sleeves, close to the outside ends, and there are small holes drilled in the housing of the axle that register with these lips. In installing the bearing sleeves they are compressed so the split edges lap and then they may be easily sprung into place, but to remove them sleeves must be again compressed, and because of manner

of construction and installation this cannot be done without twisting or bending them sufficiently to change the alignment, and this changed alignment cannot be restored so that the bearing will be perfect. The manner of dealing with this condition is to remove the sleeves, if this is necessary—which necessity will be evidenced by the play or wear of the rollers within them—and then to order new sleeves, which can be readily obtained from the bearing manufacturer or from dealers in supplies, for these bearings are standard the country over.

Construction of the Differential.

On examination of the differential gearset assembly one will note that the gearset cage is in two halves, which is retained by four bolts. Removing the nuts will allow the withdrawal of the bolts and then the halves may be separated. This cage is composed of two castings in which, on the line of the division, are the bearings for the



Driving Shaft and Differential Gearset Components Disassembled.

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|-----------------------------|---------------------------------|-----------------------------|
| 1—Differential Gear Case. | 6—Outer Thrust Ring. | 11—Differential Gear. |
| 2—Differential Gear Spider. | 7—Middle Thrust Ring. | 12—Driving Shaft. |
| 3—Master Gear. | 8—Inner Thrust Ring. | 13—Differential Spider Key. |
| 4—Inner Shaft Bearing. | 9—Differential Pinion. | 14—Wheel Hub Key. |
| 5—Outer Shaft Bearing. | 10—Differential Pinion Carrier. | |

carrier or spider on which is mounted the three differential pinions. When the bolts are taken out the carrier and the three pinions may be removed and examined, and attention should be directed to the condition of the pivots of the spider, for these may be worn from the turning of the pinions. There is little probability of the pinions wearing, as they are hardened, but the pivots ought to fit the bores without play.

With the cage separated the shafts may be withdrawn through them from the inside and with them the differential gears. These gears are retained on the shaft by split rings that seat in circumferential grooves in the shaft and into recesses in the hubs of the gears, but to prevent them turning on the shafts they are keyed as well. To remove the gears from the shafts they should be forced further on, so that the split rings can be taken out, and then they may be slipped off, leaving the keys in the keyways.

How the Shafts Are Mounted.

Portions of the shafts that seat in the bearings are machined smooth, but the other sections of the shafts are not finished. The bearings slip on these shafts easily and the rollers do not fully contact with the shafts unless the sleeves can be compressed, which is only done while the shafts are in the housing. There are three thrust rings on either side, surrounding the inner bearings, between the differential cage and the axle housing, the inner and outer rings being steel and the centre rings being bronze. The steel rings are secured to the differential cage and to the axle housing by small pins, but the bronze rings are not retained.

The master-gear is riveted to the spider of the differential cage and it can be replaced in the event of wear. Care should be taken in examining the teeth of the gears and pinions to see that they are not chipped or burred, and the rivets of the axle housing should be gone over thoroughly. In the event that these have become loosened restoration can be made by putting in new rivets, or welding can be resorted to. Either of these may be more of a job than the owner would care to undertake, and may be regarded as one that ought to be sent to a shop.

(To Be Continued.)

PISTON RING DIRECTORY.

The Burd High Compression Ring Company of Rockford, Ill., has published the "Burd Piston Ring Directory" for 1916. It is a complete compendium of piston rings used on all makes of automobiles and gasoline engines in this country. The price of the directory is 50 cents.

TECHNICAL SCHOOL OPENS OCT. 2.

The Technical School for Carriage Draftsmen and Mechanics, in the Mechanics Institute,

20 West 44th street, New York City, will open its day and evening classes for the season on Oct. 2. The school is conducted under the auspices of the Carriage Builders' National Association and the National Automobile Chamber of Commerce.

S. K. F. BEARING BOOK.

The S. K. F. Ball Bearing Company of 50 Church street, New York City, has issued an elegantly finished book entitled "Ball Bearings as an Automobile Sales Factor." This title is made the subject of an argument which is carried out in the book with text and illustrations in an extremely convincing manner. The manufacture and tests of the S. K. F. bearings are described and also the reasons for their use in well known makes of automobiles.

TWENTY CENT GASOLINE.

Standard Oil officials were recently reported as stating that the price of gasoline would soon fall to 20 cents a gallon. They also are reported as quoting that figure as the minimum for this year. The price in the East has fallen several cents a gallon in the past few weeks, while out West the price is five or six cents a gallon cheaper, around 17½ and 18 cents.

It is stated from the same source that the full effect of the increased crude oil production, which has resulted from the heavy yield of wells drilled last year, will be over in a few weeks and that the low price obtaining at that time will probably be the bottom, as the new wells now being drilled will have no appreciable effect upon the market in the near future.

The Standard Oil Company is drilling its new wells as fast as possible and all the available stock on hand is being placed on the market, except a sufficient quantity to keep a normal reserve stock.

OMAHA AUTOMOBILE SHOW.

The automobile show at Omaha, Neb., will be held from February 26 to March 3 inclusive. Notice of these dates has been sent out by Clark C. Powell, 2021 Farnum street, Omaha, Neb.

KOEHLER ONE-TON TRUCK.

The H. J. Koehler Motor Corporation, Newark, N. J., has issued a large descriptive folder describing the Koehler one-ton truck chassis, which sells for \$895. It also illustrates the power plant, radiator, the Torbenson internal gear drive rear axle and a birdseye view of the chassis, showing the accessibility of the various parts.

HARVEST AUTO RACING CLASSIC.

Program Consists of Three Races for Which
a Total of \$12,000 in Prizes Is Offered.

There is every promise of a big and fast field in the Harvest Auto Racing Classic, to be held on the brick speedway in Indianapolis on Sept. 9 for a purse totalling \$12,000. There will be three races, 20-mile, 50-mile and 100-mile events, and the latter race will be recognized in the championship awards, which will be made at the end of the year by the A. A. A. contest board. Prizes of \$1000 and \$2000 respectively will be divided among the winners of the first and second events, while the 100-mile race carries a purse of \$9000, which will be awarded as follows: Winner, \$3500; second, \$2000; third, \$1200; fourth, \$1000; fifth, \$600; sixth, \$400, and seventh, \$300.

Entries in all the events are made under class E, allowing the entry of non-stock cars with piston displacement of 300 cubic inches or less. The maximum weight is 2500 pounds. To date there are six entries, all of whom are well known to the speedway fans. Present indications point to a field of over 25 drivers before the entries close on Sept. 6. Those entered at present are: John Aitken, Peugeot; Charley Merz, Peugeot; S. Ostweil, Ostweil-Special; Josef Christiaens, Sunbeam; Gil Anderson, Stutz; Howard Wilcox, Premier.

OLD GEAR DRIVEN HAYNES.

The Haynes Automobile Company in its search for early types of its own manufacture recently uncovered one 20 years old, which was purchased in 1897 by James E. Howard, a shipbuilder of Jeffersonville, Ind.

This makes the second old Haynes that has been located, the other being found in Bound Brook, N. J. The award which the Haynes company offered lays between these two machines, which were both brought out in the latter part of 1896. The car in the possession of Mr. Howard, is one of the old surrie models, with the motor in the rear of the car, a water tank on either side and the gasoline tank in the dash. A two-cylinder motor, with gear power transmission to the axle, constitutes the power plant. The other car, which is the nearest competitor in the Haynes longevity contest, was driven by a chain.

BRITISH-MADE FORD CAR.

The Ford Motor Company, Ltd., of England, the British branch of the American concern, is planning the establishment of plants in that country to make possible the entire manufacture of a Ford car. At present the parts are largely imported and assembled at the Manchester factory. Until the war broke out plans were under way for manufacturing the Ford in England, but circumstances

arose which prevented the completion of the factory extensions. Recently, however, conditions have changed and 70 acres of land have been acquired in Southampton, where a factory to cost nearly \$3,000,000 will be erected. When this is completed and in running order the Ford car made there will be a British product. It is not expected that the plant will be running for nearly two years.

NEW HAYNES ROADSTER.

Deliveries are now being made of a new Haynes four-passenger roadster which has a commodious body for a small party. They are furnished on either the "Light Six" or "Light Twelve" chassis.

PRICE CUTTING RUMORS.

The rumors in New York City regarding contemplated cuts in the price of automobiles selling in the same class with the Ford have not been confirmed as yet by any of the manufacturers whose names were connected with the stories.

Rumors to the effect that the Chevrolet would be manufactured with an eight-cylinder motor to sell for \$700 was denied by W. C. Durant, president of both the Chevrolet and General Motors companies, he also issuing the following statement:

"In addition to the disturbance and annoyance which it causes to Chevrolet agents and dealers, perhaps the most serious effect is to convey to the public the impression that there is an absence of settled business policy governing the leading motor car manufacturers."

POPULATION BOOM IN DETROIT.

There has been a big land boom in Detroit incident to the big population increase that the city has experienced in the past two years. "'A million in 1920' is the present slogan in reference to the population of Detroit," says the manager of the United States Rubber Company in that city.

Further commenting on the boom, he says: "In connection with its remarkable industrial expansion, Detroit has had a new experience in the way of suburban land investment. During the first six months of 1916 there were 239 plats of sub-divisions filed, covering 59,422 lots.

"Although there is no official report, we have reasonably complete reports for the automobile business, including Detroit and suburban towns of Hamtramck and Highland Park for 1915. The num-

ber of cars assembled was about 450,000 and their value in the neighborhood of \$330,000,000. This would indicate a total manufactured product of automobiles for the district of Michigan of approximately \$600,000,000. The automobile figures that are given out for 1916 are positively startling in their magnitude. Judging from a canvass made in May and reports received from every factory of magnitude, the production for the year will be about 950,000 cars."

ROAD ENGINEERS NEEDED.

The enormous volume of new road building that is under way in the United States has resulted in an acute shortage of trained men in the highway branches of civil engineering. Salaries for men in this line of work range from \$900 to \$5000 a year, with an average salary of about \$1800 annually.

There are nearly 1600 engineers at present in the employ of 24 state highway commissions and in addition about 2000 are employed as county and city engineers in 19 of the states. Highway commissioners not only report that the highway departments will need double this number in the course of five years, but that preference in hiring these men will be given to graduates of college highway engineering courses.

R. M. SEEDS COMPANY BOOKLET.

Under the title of "330 University Square," which is the address of the Russel M. Seeds Company, advertising agency in Indianapolis, that concern has issued an interesting little booklet illustrating the exterior and interior of its new home.

WOODS DUAL POWER BOOK.

The Woods Motor Vehicle Company, Chicago, has issued a beautifully illustrated booklet on the Woods dual power car. It is not only extremely interesting from the fact that it delineates in a clear and attractive manner the new Woods product, which embodies the unique design of two power plants and an electric generator which furnishes the power when the gasoline motor is shut off.


It is an extremely interesting design, as shown in the phantom illustration of a section of the car and has numerous advantages over the car with but one source of power to rely upon.

PAPER ON OILS.

The Bureau of Standards, Department of Commerce, is issuing a report of the experiments on which were based the expansion tables of circular No. 57, United States standard tables of petroleum oils. The paper, which is of great interest to oil producers and refiners throughout the country, will be mailed upon application to the Bureau of Standards, Washington, D. C.


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CONNECTING MITCHELL AMMETER.

(J. P. C., Attleboro, Mass.)

How can I connect an ammeter in the electrical system of my 1915 Mitchell light six so that both the charge and discharge rate of the battery will be shown? Is the light colored wire from the dynamo the charging wire?

The diagram on this page will show how the various wiring connections are made. Of the three wires from the motor generator, those marked M and D+ are used in starting, when the unit functions as a motor, and D+ and D are used for charging, when the unit becomes a dynamo. It will thus be seen that the wire connecting D+ to the right hand front terminal of the starting switch (under floor boards) is the part of the circuit in which the ammeter should be connected.

Remove the end of this wire from the starting switch and connect it to one of the meter terminals, after the meter has been attached to dash board. Provide another length of wire, having the same carrying capacity as the other and long


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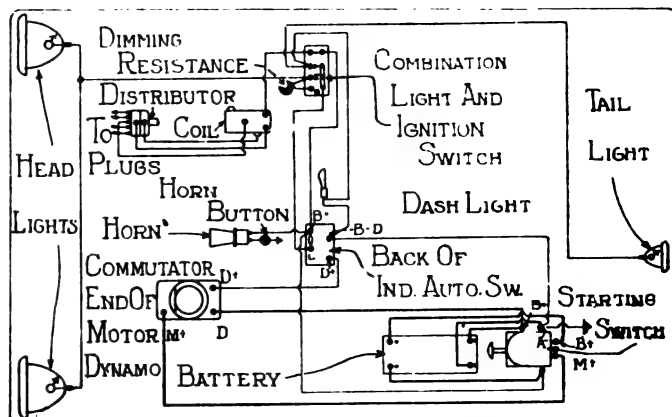


Diagram of Electrical System of a 1915 Mitchell Light Six.

enough to reach from the meter to starting switch, connecting this to the second meter terminal and to the same terminal on the switch from which the other wire was removed. If, when starting, the meter reads "charge" instead of "discharge," simply reverse the connections on meter.

WORN OLDHAM COUPLING.

(M. F. C., Boston, Mass.)

After spending a great deal of time trying to locate a very objectionable noise in my motor, and going to some expense to have the bearings taken up, which did not stop it, I finally found that it came from a worn magneto coupling. I enclose a sketch showing how this is made. Please tell me how to take up the wear, which is considerable, as I can rotate the shaft of magneto back and forth quite a lot.

Your sketch, which is reproduced on this page, is a flexible connecting device known as the "Oldham" coupling. The wearing surfaces of these couplings are usually hardened, but, in spite of this, they wear down and permit considerable play after a time, owing to the peculiar action of the magneto armature, which alternately lags behind and runs ahead of the driving shaft. As soon as slight wear permits of angular motion between the two shafts, the impact with which these oscillations are arrested increases rapidly as the wear progresses, so that the trouble, having once started, soon becomes aggravated.

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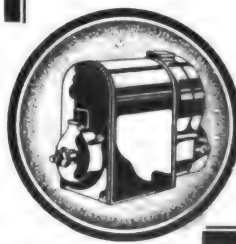
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It is practically impossible to take up this wear by the insertion of shims, as these soon work out, owing to the nature of the drive, and the only satisfactory repair is to fit new couplings. When these are installed, care should be taken to get the armature shaft and magneto driving shaft in their same relative position, otherwise, the timing will be changed.

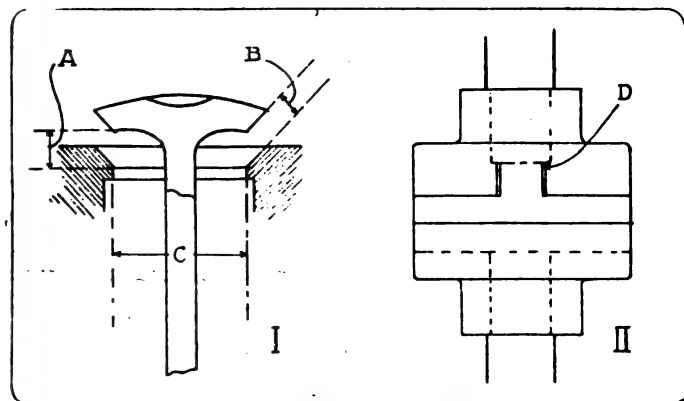
VALVE SIZES.

(A. K. D., New Brighton, N. Y.)

Being interested in aviation and high speed motors, I have closely followed the development of these high duty engines, and am familiar with most of the recent designs. There seems to be a growing tendency to use multiple valves in the cylinder head, and although the object in using two inlet and two exhaust valves undoubtedly has for its object an increase in valve area, I notice that the diameters of some of these valve heads are quite small, being not much more than one half the size of a single valve ordinarily used in cylinders of similar dimensions.

As the valve area varies with the square of the diameter, nothing is gained when multiple valves of considerably reduced diameter are used. For example, if a two-inch inlet valve is compared to multiple valves having a diameter of one inch, it would be necessary to use more than four of the latter size to effect any gain in area, and, assuming that five were used for the inlets and five for the exhaust, it would require a cylinder head out of all proportion to the bore to accommodate this number of seats.

Just what claims are made for multiple valves? Is the



An Oldham Worn Coupling (at Right); at Left, Sketch Illustrates Effective Valve Areas.

idea to make them lighter, so that, with reduced inertia, they may be made to open and close more quickly?

This inquirer shares a prevalent misunderstanding with regard to effective valve areas. While it is true, of course, that the area of the head of a valve varies as the square of the diameter, it is not the area of the head that determines the size of opening through which the gases must pass. This opening is found by multiplying the circumference of the valve seat by the lift of the valve, or rather, in the case of the bevel seated valve, it is the product of the circumference of the valve head, at its smallest diameter, and the perpendicular distance between the face of head and valve seat, the latter being somewhat less than the vertical lift.

This annular opening is the limiting factor in figuring gas velocities because it is smaller in area than the opening through the valve seat. This would not be true if the valve could be given greater lift. For example, if the perpendicular distance between valve and seat were one-quarter the diameter of the valve, the area of the annular opening would be the same as the opening through the seat. In a two-inch valve the effective opening would have to be one-half inch, but since the ratio of the lift to the effective opening is as 10 to seven (owing to the 45 degree angle of the seat), this would require a lift of about 23/32-inch, which would be impractical.

Since the annular opening around valves varies directly as the diameter (assuming the lift to remain constant), it will be seen that two valves, as compared to a single valve of

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AUGUST 25, 1916.

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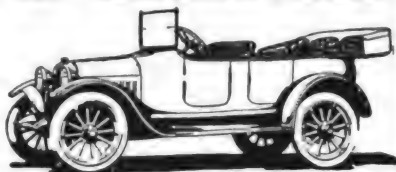
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larger diameter, would provide greater opening so long as their diameters are even slightly larger than that of the single valve. The construction possesses the further advantage of reducing the inertia of the parts, resulting in quicker opening and closing and quieter operation.

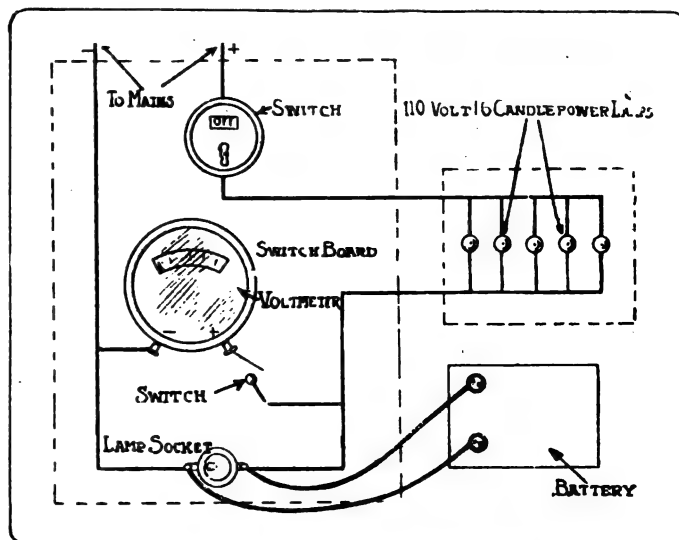
CHARGING STORAGE BATTERIES.

(W. H. K., Bridgeport, Conn.)

Will you please let me know if it would be practical to charge my storage battery from the lighting circuit in my house? The voltage is 110 and I believe it will be necessary to reduce this so the cells will not be overcharged. What would be the best way of doing this?

If it is intended to charge the battery frequently it would pay to rig up a small panel to carry the necessary fittings. The sketch shows a practical arrangement for such a board, with a diagram of the wiring. A small shelf should be provided under the board on which to place the battery.

A bank of 10 110-volt lamps connected in parallel, as shown (only five are shown in sketch) would serve as a rheostat, holding the charging rate down to approximately five amperes. If it is desired to make use of these lamps for illumination it would be better to use 100 volt bulbs, which would burn brightly and only increase amperage slightly. A small board carrying the lamps could then be placed wherever the illumination is wanted, the wiring being extended to it from



Arrangement of a Practical Home-Made Charging Panel.

the main switch board.

It is not essential to use the voltmeter, as this instrument is rather expensive and the condition of the battery can be even better determined by the use of a battery hydrometer, which is comparatively inexpensive. With this instrument it is possible to test the individual cells by testing the electrolyte, which should give a reading of 1250 when up to full capacity.

CAUSE OF CARBON IN CYLINDERS.

(N. H. B., Walpole, Mass.)

Being a subscriber to your journals for the past two years I would like to obtain a little information. How does an overabundance of lubricating oil cause carbon to form in the combustion chamber of the cylinders?

Lubricating oil is a compound of hydrogen and carbon. The average oil consists of 80 per cent. carbon and 20 per cent. hydrogen. You, no doubt, know that there is an extremely high temperature in the combustion chamber and because of this all oil reaching this place is partially decomposed. Carbon thus formed is a very fine powder.

Whenever a short circuit in the wiring is suspected it usually can be located by testing the ignition at night time or in a dark place. If there is a short circuit a spark will jump from the wire to the metal with which it is in contact.

AUGUST 25, 1916.

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To Users of DIXIE Magneto

NOTICE!

Splitdorf Electrical Company is the owner of numerous patents covering the DIXIE Magneto, the numbers and dates of same being stamped on every machine leaving our factories. These patents together with the known financial responsibility of Splitdorf Electrical Company fully protect every user of DIXIE Magnetos.

It has been brought to our attention that certain persons are notifying our customers that DIXIE Magnetos infringe a patent issued in 1903. Splitdorf Electrical Company is fully aware of said patent, which in the opinion of the Splitdorf Electrical Company's experts and attorneys does not relate in the remotest degree to the DIXIE Magneto, and in their opinion is invalid.

The patent has lain dormant for over 12 years, and is only resurrected now after the remarkable success of the DIXIE. The owners of the said patent, so far as we can learn, are not now or never have manufactured magnetos and seem to be writing DIXIE users in the hope of forcing Splitdorf Electrical Company to recognize their claim. The address of Splitdorf Electrical Company is well-known to these people and if they honestly believe their patent is infringed they should immediately sue Splitdorf Electrical Company.

Splitdorf Electrical Company wish to notify their customers to ignore notice referred to, and to promptly forward same to them so they may take proper steps to protect their customers from further annoyance.

We respect the valid patents of others, operate under our own valid patents, and fully guarantee our product free from all infringement.

SPLITDORF ELECTRICAL CO.
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a Copy

VOL. XLII.

SEPT. 10, 1916.

NO. 3.

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Treasurer - - WILLIAM H. BLACK

Secretary - - - - D. O. BLACK, JR.

Published the 10th and 25th of each month by the

AUTOMOBILE JOURNAL PUB. CO.,
Times Building, Pawtucket, R. I.

THE Outstanding Value of interstate and transcontinental highway systems, from the military as well as the industrial and economic viewpoint, is well illustrated in the leading feature article of this issue concerning the new Dixie Highway. The endeavor to bring this system to its highest possible point of perfection is receiving the support and indorsement of the great majority of citizens living within the territory it taps, among whom are numbered many of the large motor car makers of the Middle West.

CONSIDERED as a Military Asset, the Dixie Highway has great potentialities, and it is being studied closely by the United States War Department from that angle. Cutting through the heart of the country, from the Gulf to the Great Lakes, it furnishes a great avenue of travel through a region occupied by approximately 50,000,000 people, and a section in which some of the largest American industries are located. It is confidently expected that the highway will not only open up a wonderfully interesting section to motor car tourists, but will prove a great artery of commerce for the farmers and truck gardeners along its route.

THE United States cannot have too many of these great highway systems linking up its great commonwealths and communities. They constitute an influential factor in the advance of civilization, and motorists should take pride in the fact that they as a class exerted the greatest single influence toward their development, and should continue to urge upon their local authorities the necessity for continuing the development of the roads in their individual localities.

THE Growing Importance of highway improvement is increasing the need for trained road engineers and the demand for more educational facilities. The field offers ready employment for trained men and better chances for rapid progress than any other civil engineering branch. There are 75 universities and colleges now offering courses of varying length in road engineering work, several of which offer special studies and confer either certificates or scholarship degrees upon their graduates.

A COMMON Sense Plan for road signs is being fostered by the Greater Dayton Association, Dayton, O., this organization urging the placing at the corporate bounds of every Ohio city sign boards that inform the incoming stranger of the name of the city, its population, direction of local points of interest, speed limits, etc. As the motorist departs from a city he sees on the reverse side of the board information about dangerous crossings, distances, routes and common sense advice about safe and sane driving. It is an idea that could be beneficially emulated by municipal authorities everywhere.

THE Automobile Show season has been started, and all reports indicate that this year is to be a record breaker in point of attendance, exhibits, sales and general interest. The managers of the national shows are already at work upon the preliminary details of their exhibitions, which promise in every respect to be the greatest ever held in this country. As in the past, The Automobile Journal will publish special numbers containing complete descriptions of the shows and the individual exhibits at each.



It's the same **old COES**

How often have you heard the repairman, machinist or shop manager say, "It's the same old Coes, just as good as the day I bought it—it will last forever."

That is evidence of the quality that has made Coes wrenches the standard the world over.

Coes Wrenches made today are just as good as the Coes Wrenches produced 50 years ago.

The material is selected with the same care, made by equally experienced and trained wrench makers, in a factory which specializes in wrench making. The wrenches are finished carefully and many times tested to assure the quality that will meet every requirement placed upon them.

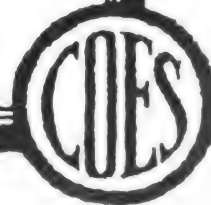
Car owners who know wrench values demand the Coes. It is most popular with automobile repairmen, and in every other line of mechanical work Coes Wrenches will be found on the benches and in the tool kits of the expert workmen.

Coes wrenches can be had in just the size to fit any use. Any Coes will afford the same long and satisfactory service. It is always dependable and from the standpoint of wrench service it is the cheapest wrench produced.

Coes wrenches are sold wherever motor cars are used. They may be had of all jobbers, automobile supply houses, and automobile and hardware dealers.

Catalogue on request.

Coes Wrench Company, Worcester, Mass.



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Compare Regal, At Its Price On Performance, Size and Style



Feature for feature, this new Regal-4-Thirty-two favors anything in the market at the price.

Take this car as a whole—mark its long wheelbase of 108 inches. With its low-hung, cruiser-built body and its sweeping lines that accentuate its generous length and width.

Note the super-man's-size entrance of its wide, deep doors or loll on its luxuriously thick upholstered seats.

Look at the electrically lighted instrument board and you will find a completeness of fittings used only on the more expensive types of body.

And the finish, within and without, is quite up to that of the costlier cars.

Under the hood comparison again favors Regal—in the extra large Regal-built motor of 32 horsepower ($3\frac{1}{2}$ " bore x $4\frac{3}{4}$ " stroke),

a plant with power to spare, suspended at four points for greater steadiness.

In the three bearing crankshaft—a removable head—of ultra-modern construction.

In the sturdy, well designed, full floating rear axle—in the vacuum feed gasoline tank of 14 gallons capacity.

In every advantage or convenience that your customers may bring up, you'll find that the Regal has the edge on its price-competitor.

Doesn't it follow then, that you will find the Regal easier to sell than any other comparatively priced car on the 1917 market?

Get in touch with us for open territory suggestions. We have a few of them at present—but not for long with this big car.

REGAL MOTOR CAR COMPANY

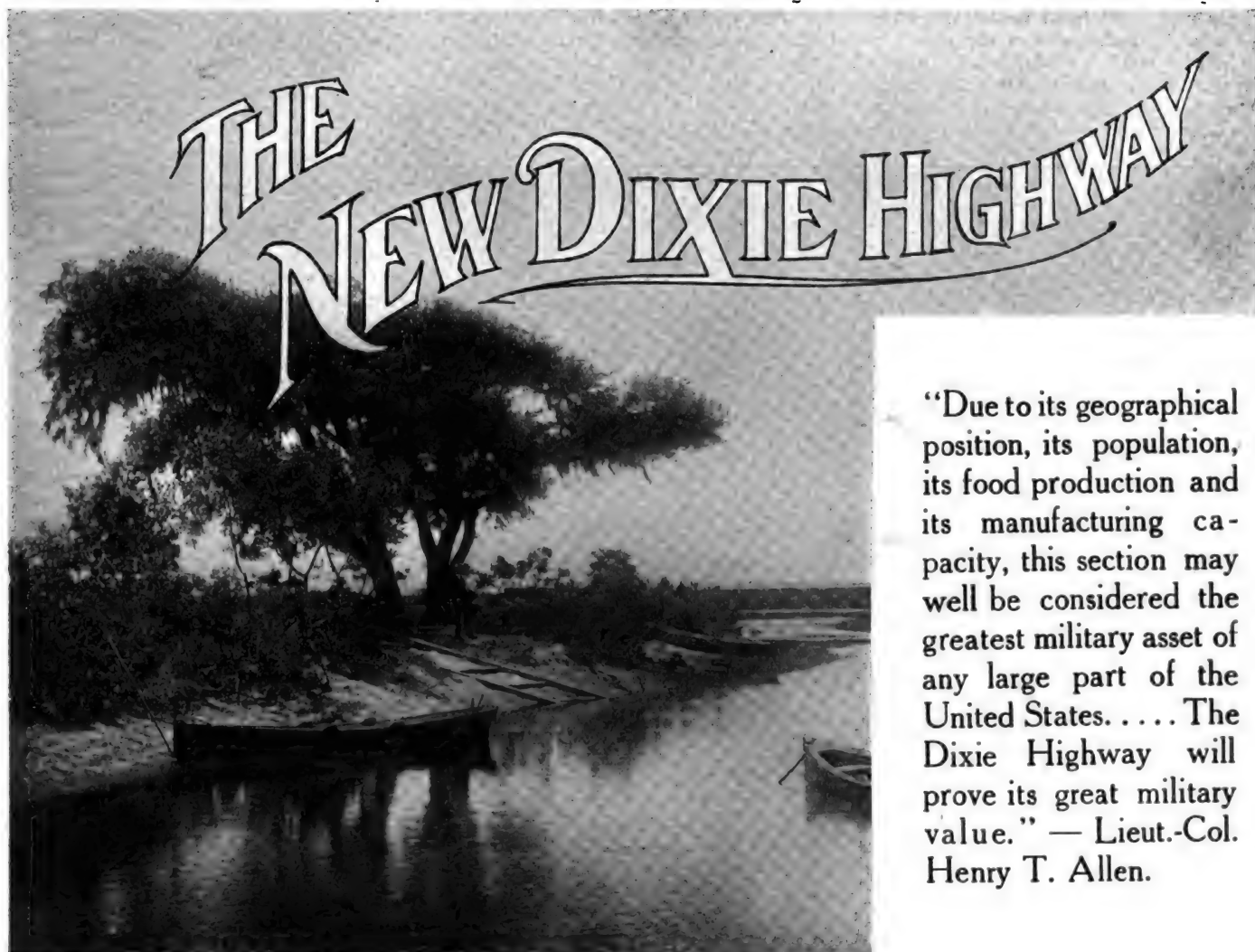
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DETROIT,

MICHIGAN

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AUTOMOBILE JOURNAL



"Due to its geographical position, its population, its food production and its manufacturing capacity, this section may well be considered the greatest military asset of any large part of the United States. . . . The Dixie Highway will prove its great military value." — Lieut.-Col. Henry T. Allen.

EVEN the most ardent pacifist having his country's welfare at heart could not feel that he should refrain from joining the good roads movement that is sweeping the country, yet in this widespread propaganda lies the very essence of defensive strategy, a fact which has been proven beyond all doubt in the European conflict. History will state that the great roadway leading for 90 miles to and from Verdun, which made possible the continuous stream of motor trucks laden with ammunition and supplies, was the pivotal factor in the successful offensive conducted by the French. For over two weeks thousands of trucks circled this loop only a few feet apart, performing a service that under any other system would have been impossible.

In this country the road movement has attained its greatest momentum, although it is not necessarily based upon preparedness; nevertheless, it is the greatest preparedness movement, accord-

ing to all modern military authorities, that the nation is interested in. With our unexcelled facilities for producing trucks and automobiles and ammunition and enormous forces upon which to draw, the only missing link to an almost invulnerable militarism would be found in a lack of efficient, well made and permanent road systems leading from the centres of production to the strategic points.

Dixie Highway Great Military Asset.

Our great transcontinental systems of roads, which are already in a state nearing completion, would be found extremely valuable in case of war, but it is doubted by many authorities if they would prove as great a military asset as the great Dixie Highway system which taps the heart of the country from North to South.

This system, which is being developed by a very active organization, headed by Judge M. M. Allison, president of the Dixie Highway Association, and which

received enthusiastic support from prominent men in all of the eight important states in its range, is rivaling in popularity the two main cross continental routes, the Lincoln Highway and the National Old Trails road, although these two systems have been in process of development for many years.

Over \$30,000,000 have already been spent on the various links of the new Dixie Highway and large appropriations for further improvements and betterments have been secured from the different states and counties through which it runs.

The system of roads embraced in this highway extends from Miami, Fla., to Mackinaw, Mich., and at both extremes and in the central section the work of construction and promotion is being prosecuted with enthusiasm such as has never before been connected with a good roads movement. In location it has the same relation to the people living in the North and South, east of the Mississippi,

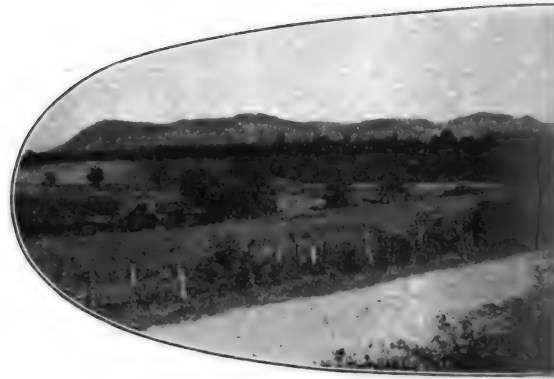
as the two transcontinental highways have to the automobilists of the East and West. While primarily for the purpose of providing ideal touring conditions between the Gulf of Mexico and the Great Lakes, and to promote interchange of industrial products between the people of the North and South, it has an inestimable industrial value, as well as great strategical value in case of war.

50,000,000 People Along Route.

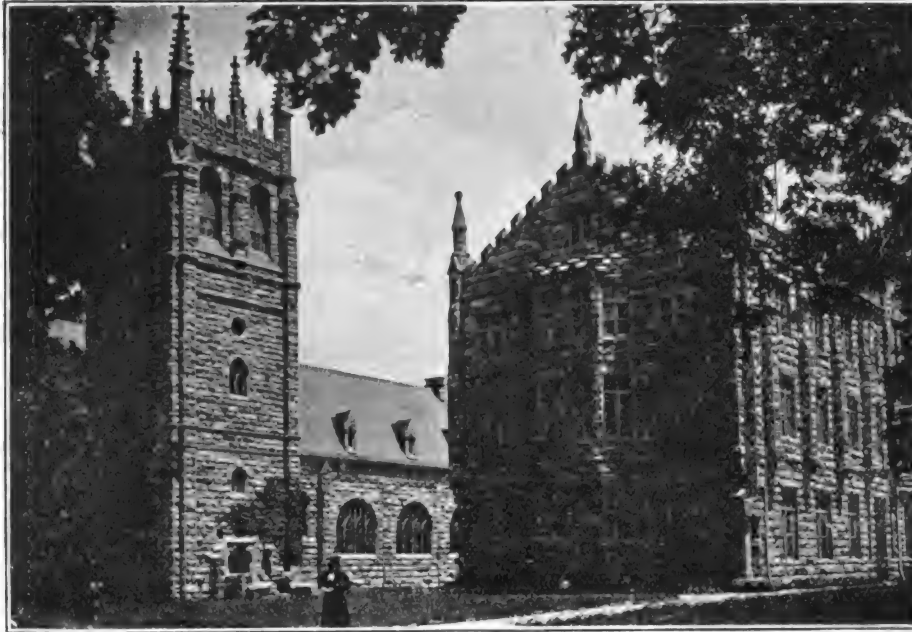
This great system of roadways covers the outward boundaries of the states of Michigan and Florida, and passes through Illinois, Indiana, Ohio, Kentucky, Tennessee and Georgia and into Florida. It will, when completed, furnish an ex-

cellent system of highways through a territory occupied by nearly 50,000,000 people and where three-fifths of the automobiles and trucks of the world are manufactured. This section has always contributed large bodies of men during war times and its importance for military purposes has been recognized by some of the leading military authorities. Lieut.-Col. Henry T. Allen of the Eleventh U. S. Cavalry, is enthusiastic over its possibilities, as shown in a recent statement made by him concerning its value. Col. Allen said:

"In the Dixie Highway we find a magnificent line from Chicago through manufacturing centres, including Indianapolis, Louisville, Nashville, Chattanooga, Atlanta and Tallahassee; another line from the very heart of the Great Lakes, Mackinaw, through the following important cities: Detroit, Toledo, Dayton, Cincin-



Stretches Like This Are the Rule, Rather Than the Exception.



Library and Dormitory of University of the South at Sewanee, Tenn., on the Summit of Cumberland Mountain.

always furnished more than its quota of soldiers for every war in which the nation has been engaged. Due to its geographical position, its population, its food production and its manufacturing capacity, this section may well be considered the greatest military asset of any large part of the United States.

"Probably no branch of the government is more keenly interested in the completion of the Dixie Highway than the army, and to no branch can it have a more important bearing. With the inevitable change in our military policy, involving the concentration and organization in time of peace of such commands as would be required in war, the country between the Lakes and Florida will have an added military interest in which the Dixie Highway will prove its great military value."

Automobile Interests Behind Plan.

In Michigan the great link of the Dixie Highway, which encircles the state's borders, is being fostered by the Good Roads Committee of the Detroit Board of Commerce, which includes some of the best known men in the automobile trade. This summer a party of over 100 members of the board made a trip of 400 miles over this section in the interests of its development.

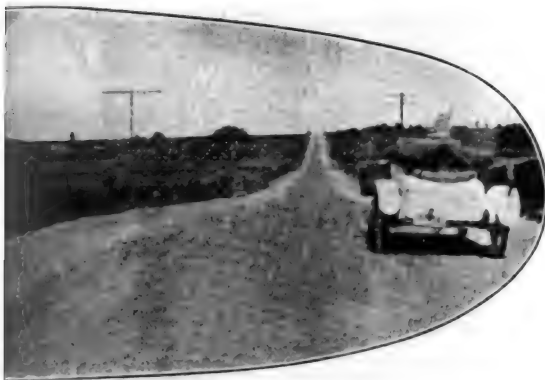
While this work is going on steadily in

cellent system of highways through a territory occupied by nearly 50,000,000 people and where three-fifths of the automobiles and trucks of the world are manufactured. This section has always

nati, Knoxville, Chattanooga, Atlanta, thence to Jacksonville. In a word, the Great Gulf and the Great Lakes are joined by a wonderful highway passing through a section of the country that has



Type of Roads to Be Found in Vicinity of Savannah, Ga., Illustrative of the Care with Which All Sections of the Dixie Highway Are Constructed.



the entire distance, as routed in the accompanying itinerary, but when the entire system as shown on the map is completed it will form a highway which will be without a peer in the world for scenic beauty and variety of climate.

After passing around the State of Michigan, on the shores of lakes Erie, Huron and Michigan, through forests of gigantic trees and into the centre of the automobile industry of the world, the highway strikes into that rich and fertile territory occupied by Ohio, Indiana and Kentucky. In Tennessee the environment becomes more mellow and the foliage along the roadside suggests the southern climate, while in the southern

through on the first part of the tour. From the cold, chilly winds of Mackinaw straits the tourist experiences every climatic condition prevailing in the United States until the arrival at Miami, where it is summer time the year around.

As Florida has been gaining in popularity each year as a wintering place, it is expected that the completion of this highway will result in thousands of tourists making the trip every fall and winter, increasing the patronage at the beach resorts as well as bringing the residents of that state and Georgia in closer touch with the great metropolises of the middle west during the summer time.

than the Exception Along the Dixie Highway.

the northern end of the system, the southern extension into Florida is being rapidly developed. In the latter state a new link is under construction, it forming one of the most unique road projects ever attempted in this country. This is a new route from Arcadia to Miami, Fla., over the Tamiami trail.

This link instead of crossing the state north of Lake Okeechobee, continues south from Arcadia, through Punta Gorda, Fort Myers and Marco, where it strikes across the Everglades on a straight line for 70 miles without a curve, into Miami, the southern terminus.

World's Finest Boulevard.

The material for constructing this road is being taken from the excavations being made for a canal, which parallels the route and is being dug to drain that section of the Everglades. This section when completed will be the most beautiful boulevard in America and one of the finest in the world, as it is planned to plant native trees on either side of the roadway throughout the entire distance across the Everglades. Asphalt oil will be used in surfacing the thoroughfare.

At present the trip from Chicago to Miami, Fla., can be made over good roads



A Glimpse of the Mackinaw Straits from Lake Drive on Mackinac Island, at the Northern End of the Dixie Highway.

section of Georgia and in Florida the tourists see an indication of the tropics, the abundant efflorescence of the plants, shrubbery and trees making a sharp contrast to the type of country passed

The northern loop about the State of Michigan, on the other hand, should have the effect of developing that section into a great summer playground, as it parallels the two great lakes for its entire



Road Being Cut Through Suck Creek Gorge, Near Chattanooga, Which Will Be One of the Finest Stretches of Scenic Road in the South—21 Miles Long, Costing \$100,000.



Marking Northern Terminus of Dixie Highway at Mackinaw City, Mich.

Chicago-Danville, Ill.

	Miles		Miles
Chicago	0.0	Watseka	84.2
Chicago H'ghts	28.8	Hoopeston	107.2
Momence	54.0	Danville	135.8

Danville, Ill.-Indianapolis, Ind.

Danville	0.0	Brownsburg	74.6
Covington, Ind.	12.8	Indianapolis	88.9

Indianapolis-Dayton, O.

Indianapolis	0.0	Eaton, O.	84.6
Knightstown	34.2	Dayton	108.6
Richmond, Ind.	68.8		

Indianapolis-Louisville, Ky.

Indianapolis	0.0	Bedford	77.4
Martinsville	30.7	Paoli	101.0
Bloomington	52.8	Louisville	147.6

Louisville-Nashville, Tenn.

Louisville	0.0	Cave City	134.1
Elizabethtown	45.3	Russellville	194.0
Mumfordsville	76.6	Nashville	249.3

Nashville-Chattanooga.

Nashville	0.0	Pelham	80.4
Laverne	15.7	Tracy City	93.9
Murfreesboro	31.8	Sequatchie	110.3
Beach Grove	49.0	Jasper	114.2
Manchester	63.1	St. Elmo	137.3
Hillsboro	71.4	Chattanooga	140.1

Chattanooga-Atlanta, Ga.

Chattanooga	0.0	Marietta	120.7
Summersville	45.1	Atlanta	139.0
Rome	70.5		

Atlanta-Milledgeville.

Atlanta	0.0	Madison	70.8
Decatur	6.6	Eatonton	94.7
Stone Mountain	16.6	Milledgeville	116.3

Atlanta-Macon, Ga.

Atlanta	0.0	Forsyth	69.3
Griffin	39.8	Macon	94.5

Macon-Jacksonville, Fla.

Macon	0.0	Waycross	174.3
Perry	28.2	Jacksonville	254.8
Fitzgerald	95.7		

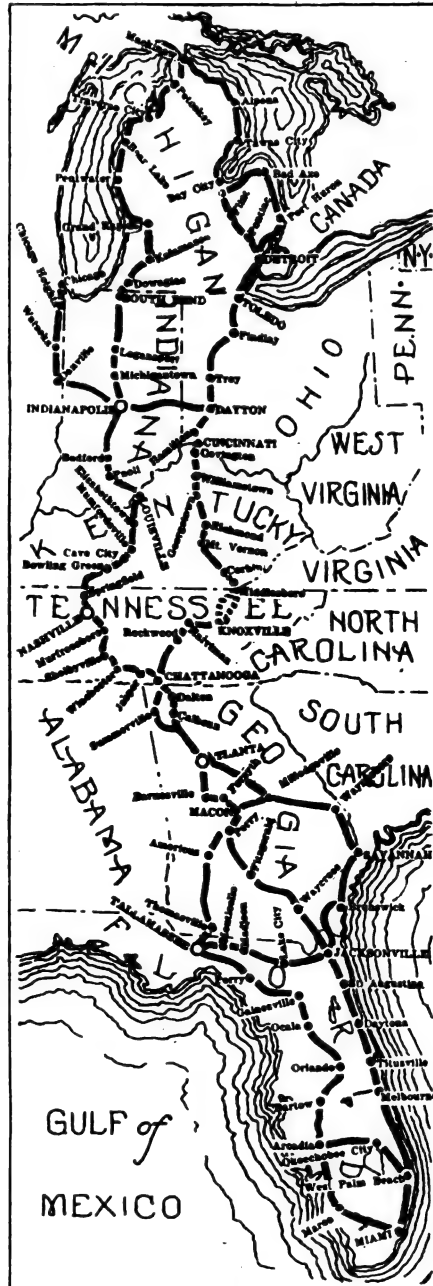
Jacksonville-Miami, Fla.

Jacksonville	0.0	Melbourne	203.3
St. Augustine	39.8	Fort Pierce	252.1
Hastings	58.3	W. P'm Beach	311.9
Dayton	113.2	F. Lauderdale	354.0
Titusville	161.9	Miami	381.9

Miami-Jupiter, Fla.

Miami	0.0	W. P'm Beach	69.1
F. Lauderdale	26.1	Jupiter	85.9

length of nearly 1000 miles. As an industrial asset, however, it should prove more valuable to Michigan because that section is rapidly being developed into the greatest manufacturing state of the union as a result of the enormous growth of the automobile industry and other lines of manufacturing.



The Dixie Highway Passes Through a Territory Occupied by 50,000,000 People.

Jupiter-Arcadia, Fla.

Jupiter	0.0	Arcadia	144.5
Okeechobee	54.5		

Arcadia-Gainesville, Fla.

Arcadia	0.0	Leesburg	167.6
Bartow	52.5	Ocala	205.9
Orlando	116.0	Gainesville	249.8

Gainesville-Tallahassee.

Gainesville	0.0	Perry	118.4
Newberry	26.0	Simmons	139.4
Trenton	40.3	Lamont	150.9
Mayo	83.0	Tallahassee	181.4

Tallahassee-Jacksonville.

(Connecting Link.)			
Tallahassee	0.0	Live Oak	83.4
Monticello	21.1	Lake City	108.6
Madison	54.2	Jacksonville	169.8



A Cool Retreat on Top of Cumberland Mountain, Near Sewanee, Tenn.

Tallahassee-Macon, Ga.

Tallahassee	0.0	Americus	129.1
Thomasville	34.3	Ft. Valley	174.7
Camilla	66.5	Macon	201.5
Albany	92.2		

Macon-Atlanta, Ga.

Macon	0.0	Griffin	54.7
Forsyth	25.2	Atlanta	94.5

Atlanta-Chattanooga, Tenn.

Atlanta	0.0	Dalton	90.2
Cartersville	41.3	Chattanooga	124.6

Chattanooga-Knoxville, Tenn.

Chattanooga	0.0	Kingston	84.0
Dayton	38.9	Knoxville	131.5

Knoxville-Cincinnati, O.

Knoxville	0.0	Berea	168.6
Cum'land Gap	67.6	Richmond	183.3
Middlesboro	71.4	Lexington	209.1
Barboursville	99.1	Georgetown	218.0
Corbin	116.1	Williamstown	252.5
London	132.6	Covington	259.6
Mt. Vernon	148.6	Cincinnati	290.5

Cincinnati-Toledo, O.

Cincinnati	0.0	Sidney	96.6
Middletown	33.0	Lima	132.0
Dayton	56.1	Findley	164.3
Troy	76.2	Bowling Green	187.2
Piqua	84.2	Toledo	210.0

Toledo-Detroit, Mich.

Toledo	0.0	Old Port	29.9
LaSalle	16.2	Wyandotte	46.7
Monroe	20.7	Detroit	58.4

Detroit-Mackinaw, Mich.

Detroit	0.0	Alpena	271.2
Flint	68.9	Onaway	340.0
Bay City	118.3	Mackinaw	382.7
Tarvas City	196.8		

Mackinaw-South Bend, Ind.

Mackinaw	0.0	Grand Haven	251.8
Petosky	38.3	Grand Rapids	283.0
Traverse City	108.9	Kalamazoo	331.6
Manistee	141.4	South Bend	406.7
Muskegon	238.8		

South Bend-Indianapolis, Ind.

South Bend	0.0	Logansport	65.7
Plymouth	23.4	Indianapolis	135.9

(Cross route from Macon, Ga., to Jacksonville, Fla., via Savannah, Ga.)			
Macon	0.0	Savannah	207.5
Milledgeville	30.0	Riceboro	242.1
Waynesboro	112.7	Brunswick	283.4
Springfield	181.3	Jacksonville	379.7

Kerosene Versus Gasoline in Standard Automobile Engines.

Excerpts from a Discussion Presented Before the
Members of the Society of Automobile Engineers.

By CHARLES E. LUCKE,

Professor of Mechanical Engineering, Columbia University.

THE problem of adaptation of the gasoline automobile engine to the use of heavier fuels than will vaporize satisfactorily in air without the use of heat, is entirely a problem of heating and heaters. Given suitable data, on the amount of heat required, on the temperature that should be maintained, on the design of suitable heaters in shape, arrangement and size, on the sources or available supplies of heat, on means of establishing and maintaining as long as necessary a suitable starting heat, on the connection between the heated mixture making apparatus and the engine, and finally on the modifications required in the engine so that it will operate properly on the mixtures hot enough to burn properly without oil or residue, carbon deposits or smoke—given such data the kerosene automobile engine can be designed by any engineer. Of course, all this is not available at the present time, but enough is, to put quite satisfactory results within reach now, with the ordinary expectation of improvement, perfection and standardization of such equipment each year of successive use.

Mixture Conditions Classified.

Mixture heaters or vaporizers have been much used in the related arts, with the stationary and traction engines using kerosene, and in the alcohol engine art, which was extended for a time in Europe to include the automobile field. Much information of value is derivable from these practises, but much must be done to secure equipment suitable for the light, flexible variable speed throttle controlled automobile engine confined to small space where stops are frequent and quick starts are necessary requirements.

These older practises are divisible into three groups, according to the conditions of the mixture produced. A similar division of automobile engine equipment is also possible with corresponding, but exaggerated, variations in operating conditions. These three mixture conditions are given the following names for the want of better ones: First, rain; second, fog; third, dry. The first of these is a wet, rain like mixture, hardly a mixture at all, in which much of the fuel is not only unvaporized, but exists in the form of heavy rain drops, or stream like films on the side walls of the passages. The second or fog condition is one in which much, if not most, of the oil is in the unvaporized state, but in drops so fine as to appear like tobacco smoke. These remain suspended in the air for a long time, as do the clouds in the atmosphere or moisture in steam, but are

ABSTRACT.

The author outlines the factors leading up to the present high cost of automobile fuel, states that the introduction of new distillation processes will not solve the problem, but that the development of kerosene utilizing appliances will produce results satisfactory to everybody.

The paper proceeds to show why kerosene cannot be used on the present gasoline cars. The adaptation of the gasoline automobile engine to the use of heavier fuels than will vaporize without the use of heat is entirely a problem of heating and heaters.

The author reviews at length the principles embodied and the construction of the heated vaporizers or vaporizing heaters now used in stationary and traction kerosene engines and in alcohol engines, giving illustrations of a number of such devices.

After thus developing what in his opinion are desirable and good principles, the author describes a form of vaporizer embodying such principles, which he states has had successful trials (both block and road) in automobile service. A semi-automatic starting burner to accompany the vaporizer is also described, both as regards its construction and operation. In conclusion the hope is expressed that the principles outlined will result in the production and use of kerosene automobiles on a scale sufficiently large to affect the price of fuel within the next year.

equally subject to the collection and precipitation or separation as rain or wall films. The fog that has not precipitated as rain or wall film is reasonably well distributed through the air, making a true mixture as distinguished from the first or rain variety. The fuel is in the liquid rather than in the vapor state, so such mixtures can be quite cold, as is also the case with the rainy mixture.

Dry mixtures, the third class, are perfectly clear and transparent, true invisible vapor and air being as thoroughly mixed, and as stable as a gas and air mixture and as hot as the fuel properties require for the vapor state of so much fuel as is present with the air. Such mixtures are subject to no pipe or wall deposits, so long as the walls are warmer than the mixture, or the mixture sufficiently superheated above its dew point, to use a useful term borrowed from the art of air conditions with reference to water in dryers, evaporators and humidifiers.

The atmosphere with its water vapor constantly illustrates all three conditions, the thermodynamic laws of air conditioning, now fairly well developed, being precisely the ones required for controlling the mixture condition of air with kerosene vapor. The dry mixture of less than 100 per cent. humidity is the ordinary invisible condition of the atmosphere. The 100 per cent. humidity or saturation condition is a division zone between the dry and the fog mixture and is defined by a temperature and an air-to-water weight relation. The passage from one to the other is partly one of temperature and partly one of physical contact or intimacy. Passage from fog or dew to rain condition is promoted by time, by contact with solid surfaces and by sudden changes of direction of flow. Any mixture to be dry must be above a certain temperature called according to one point of view the drying temperature, and to another the dew point. This temperature is fixed by (a) the vapor pressure of the liquid as related to its temperature; (b) the relative weights of air and vapor in the mixture, and (c) the intimacy, uniformity or homogeneity of the mixture. In the case of the engine the weight relations or proportions of mixture constituents, air to vapor, is fixed by the carburetor, so that the remaining variables are the dryness, the temperature and the mixture homogeneity, or the temperature alone for a given design of mixture chamber. Above this temperature mixtures remain dry, and can be said to be superheated or to have a given humidity; below this temperature mixtures must be wet, but so

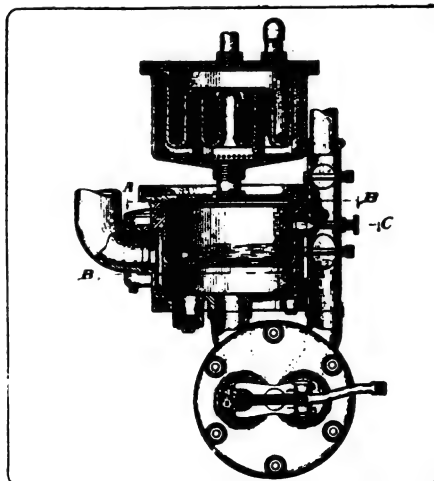


Fig. 1—Lucke-Verplanck Fog Mixture Apparatus.

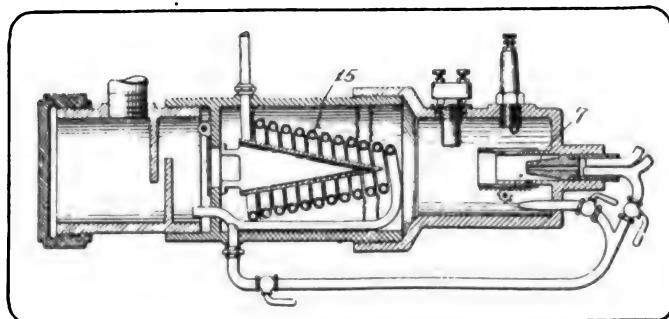


Fig. 2—Porter-Rider Fog Mixture Apparatus.

much as is not liquid constitutes a saturated mixture, the free liquid being determined by the difference between the vapor carrying capacity of air at the dryness temperature, and at the actual temperature, if these factors are known, as is the case for water vapor and air, though not yet for complex things like gasoline and kerosene.

Flow of Wet Mixtures.

Wet mixtures, whether in the rainy or the fog condition, will, as they pass through the intake or manifold, produce a wall film of liquid, which flows in a way different from the air, the vapor or the fine fog, the difference being responsible for bad distribution to the branches. Such a wall film always moves more slowly than the gaseous stream and only moves at all because of friction between the liquid film and the true mixture; it distributes circumferentially around a passage in an unequal way whenever, as is always the case, the centre stream itself is moving irregularly. For example, at a damper or butterfly throttle valve the mixture is divided into two high velocity streams, moving most rapidly along two lines at opposite ends of a pipe diameter at right angles to the throttle spindle. The liquid is thus forced around the circumference to the points where the vapor velocity is least, that is, in line with the spindle. Sighting through a glass tube the two streams of liquid would be visible, separated by two dry streaks. At an elbow the liquid can be seen in a glass tube to collect on the inside of the bend where the mixture velocity is least, and at a branch the liquid will pass from side to side of the feeder and branches as mixture velocity or flow direction changes, never dividing equally because of the time lag in the changes.

A decrease of mixture flow velocity causes greater accumulation of liquid, but a sudden increase tends to lift off the accumulation from the walls, drawing it through the engine with the effect of momentarily great excess of fuel, which may cause misfire and the action known as "choking." Again, such a film tends to produce a similar enriching effect whenever the throttle is closed suddenly, especially if it is somewhat warm, because of the sudden and great reduction of pressure, which can exceed 25 inches of mercury vacuum, and produces a sudden vaporization of the liquid film. Such conditions constitute the first objection to wet mixtures, especially to the rainy form, and to some, although to much less, extent to the fog form.

Single-cylinder engines suffer but little from these rainy mixtures because the whole product passes through one valve, and only the throttle movement producing film vaporization on closure, and liquid lifting on opening remains. The mingled streams of mixture and liquid will

partly vaporize and partly be sprayed on passing through the inlet valve. If the interior walls are hot enough the liquid that strikes will be largely evaporated, while that remaining suspended from the inlet valve spraying will vaporize on compression. Cold, wet, rainy mixtures can therefore be used in such single-cylinder engines with fair success, or in multi-cylinder engines fitted with a separate carburetor for each cylinder, if the combustion chamber walls are kept hot enough; this is the method in use in the standard farm tractor engines such as the Hart-Parr, International Harvester and Rumely. Of course, the mixture is not quite homogeneous, nor is it feasible to keep the walls hot enough, so some smoke may be expected at times and some lubricating oil solution or weeping, both being reduced as the walls become hot.

In order to carry sufficient compression to secure high mean effective pressures and thermal efficiency, or avoid the reduction of those accepted as standard for gasoline, water injection is resorted to and is successful. Its effect is threefold; first, to prevent the mixture in the cylinder reaching its ignition temperature too soon, by reason of the mixture cooling incidental to water evaporation during compression; second, to slightly raise the ignition temperature by the neutral steam dilution, also by such dilution to reduce the rate of propagation and produce a slow combustion instead of a detonating shock, and third, by water gas reaction of steam with nascent glowing free carbon in process of combustion in regions where the air is insufficient, to keep the interior clean.

Multi-cylinder automobile engines cannot use water injection, nor is it feasible to equip each cylinder with its own carburetor, though both of these things might be done if there were no other way; so it can be said that the rainy,

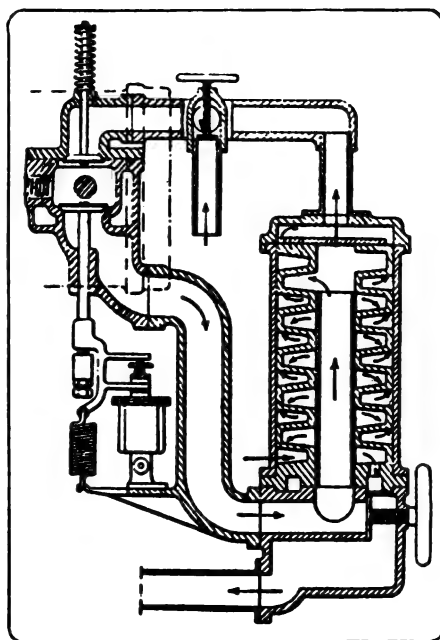


Fig. 3—Brouhot Mixture Vaporizer.

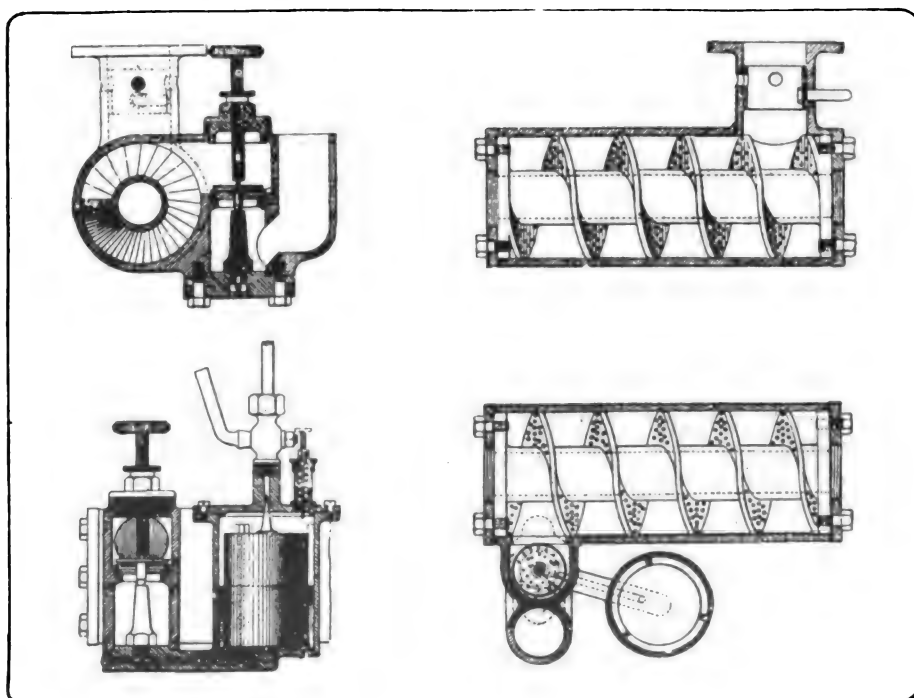


Fig. 4—Martha Mixture Vaporizer.

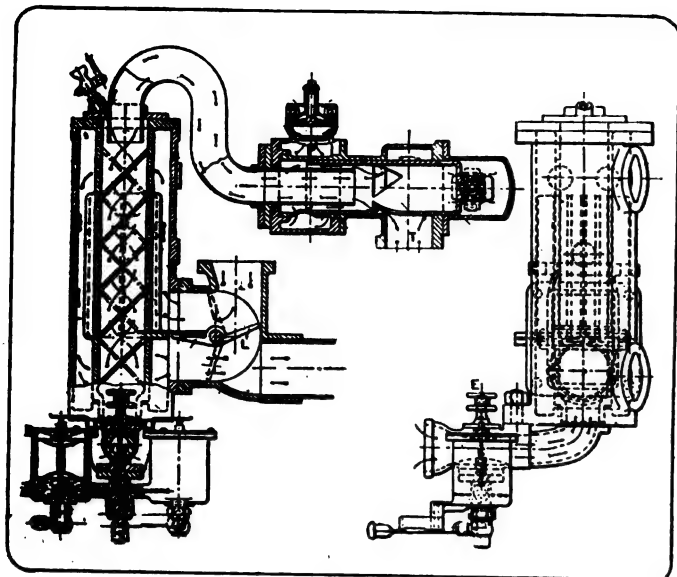


Fig. 5—Thornycroft Mixture Vaporizer.

wet mixture is not only unsuited to the automobile engine, but so also is the standard tractor engine modification of hot breech end, with water injection and individual fuel supplies.

Production of Fog Mixtures.

Fog mixtures are less difficult to handle than the rainy variety, but require some special means for their production, and as they have one peculiar advantage are of considerable interest. They exist at temperatures even lower than those of the present normal gasoline mixtures and can therefore be compressed as high or higher than gasoline as now used, with a correspondingly high mean effective pressure and large power output, and without water injection. It must be noted, however, that the efficiency is not correspondingly high, proving the high mean effective pressure to be the result of a cool dense charge rather than of efficient combustion, a fact borne out by the tendency to "weep," measured by kerosene accumulation in crank case oil. Such mixtures give some trouble in distribution, due to a tendency to precipitate and form wall films, with the evil effects of such films already noted. So far but little progress has been made toward the development and use of uniform fog mixtures of this sort, so while this may be regarded as a possible line of development for the future, it must be put in second place at the present time. The dry mixture has so many advantages of its own and the means for its production are so much more fully developed, that it must be given the preference.

Before leaving the subject of the fog mixture, it is worth while to note two different ways of producing it, involving a common, final principle. This principle is, that a fine, persisting fog of oil in air, fine enough to float suspended for a considerable time and likewise to burn as well as a true vapor-air mixture, can be produced only by condensation of a hot dry vapor in its air, the condensation being effected best by bringing the hot vapor into contact with cold air, under conditions that produce a mixture. One

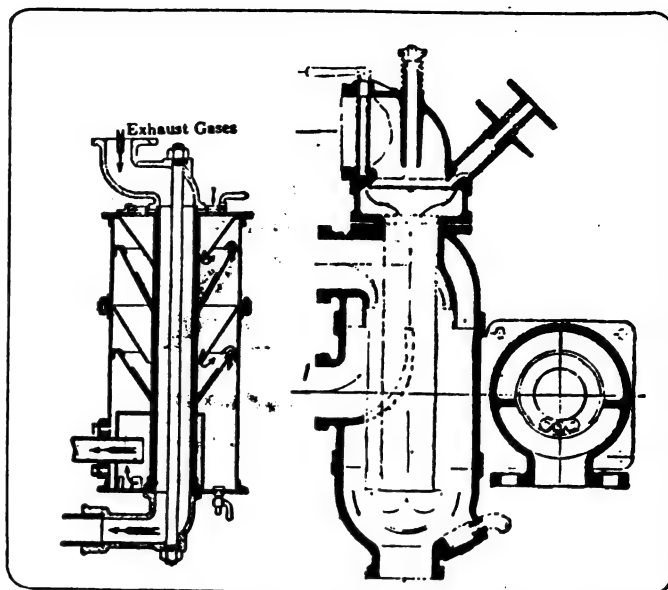
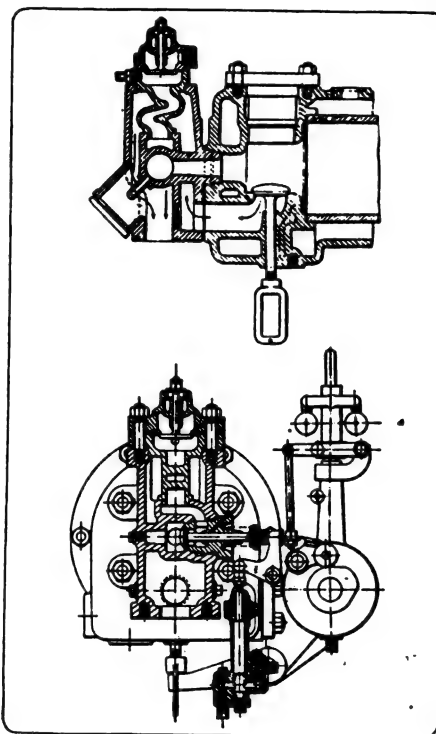
Fig. 7—At Left: Petreano Separating Mixture Vaporizer.
Fig. 8—At Right: Durr Separating Mixture Vaporizer.

Fig. 6—Fielding and Platt Vaporizer.

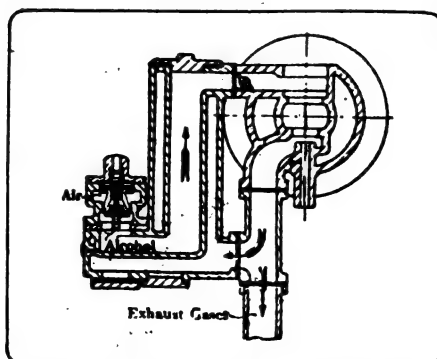


Fig. 9—Koerting Separating Mixture Vaporizer.

way of doing this, that of Lucke and Ver Planck, developed some years ago and used on some stationary and tractor engines, is illustrated in Fig. 1. Here the exhaust is used to boil kerosene kept at constant level in a boiler vaporizer, over which is fitted a water condenser constantly open to the atmosphere. Any excess heat over that required for the vapor used results in the production of excess vapor without rise of temperature, the excess vapor rising to the condenser, there giving up its heat to the water, the condensate dropping back to the boiler. In spite of any variations of heat supply, this apparatus provides a constant supply of vapor. The vaporization conditions are such as to involve absolutely no deposits of carbon or tar. The vapor is drawn from the boiler into the cold air stream entering the mixture pipe at the needle valve C and beyond this point a reasonably cool air and fog mixture is produced in constant proportions, regardless of total quantity. Such an apparatus as this, while working well, seems to be unsuited for automobile use because of its bulk and the considerable time required for starting.

Another form of fog maker, that of Porter and Rider, Fig. 2, is of less bulk, but is lacking in means for keeping the air and fuel in constant proportions, while varying the total quantity. Oil is sprayed by compressed air from the nozzle 7 and an electric spark ignites the spray, causing some of the oil to burn in the limited amount of air present and vaporizing the rest. The flame is extinguished by passage between the coils of the cooling coil 15, the hot vapor with the small amount of products of combustion mixing later with a main stream of cold air, where the cool fog is formed by condensation as in the previous case. There are other ways of forming these persisting fog mixtures, often called erroneously vapors, but for reasons noted they will not be mentioned, the two shown illustrating the idea that must be put aside at the present for the more
(Continued on Page 40.)



The 1917 Hollier Eight Four-Passenger Roadster.

AS A COMPANION model for the Hollier Eight, which has met with great success, the Lewis Spring and Axle Company, Chelsea, Mich., has added a six-cylinder car, selling at \$1085. It is an excellently designed machine, with long and nearly horizontal hood, straight body lines and slightly slanted windshield. The body is in the standard Hollier blue, rubbed smooth and highly polished.

In addition to the new model, the Lewis company has made some improvements in the Hollier Eight, the most striking of which probably are the longer hood and the straight line effect of the whole body. Mechanically considered, an outstanding improvement is the adaptation of adjustable clutch and brake levers, making the car to fit the exceptional driver as though built to order. This model for 1917 is priced at \$1185.

Riding Qualities of the Six.

The new six has remarkable riding qualities, which is largely due to the employment of the half elliptic springs at the front and full cantilever in the rear, the latter being 42 inches long. This spring assembly is the same as used in the Eight, which won for that model the slogan "The Car with Five Front Seats."

The block motor in the Hollier Six has been thoroughly tested and found effi-

cient. It is of the valve in head type, with bore of three inches and stroke of $4\frac{1}{4}$ inches, having horsepower rating by the S. A. E. formula of 21.60, though the manufacturer lays claim to a higher power due to the high speed characteristics of the engine.

Conspicuous in the motor arrangement is the accessibility of the valves, pistons and interiors of the cylinders. All the valves are actuated by one cam shaft, directly connected to the crank shaft by helical timing gears of steel and iron, with one-inch face, enclosed in the front end of case and running in a bath of oil at all times.

Conventional practice is followed in the layout of the moving parts of the engine. The pistons have three rings each, and the connecting rods are alloy steel I-beams. The crank shaft, which is of a special alloy and $1\frac{9}{16}$ inches in diam-



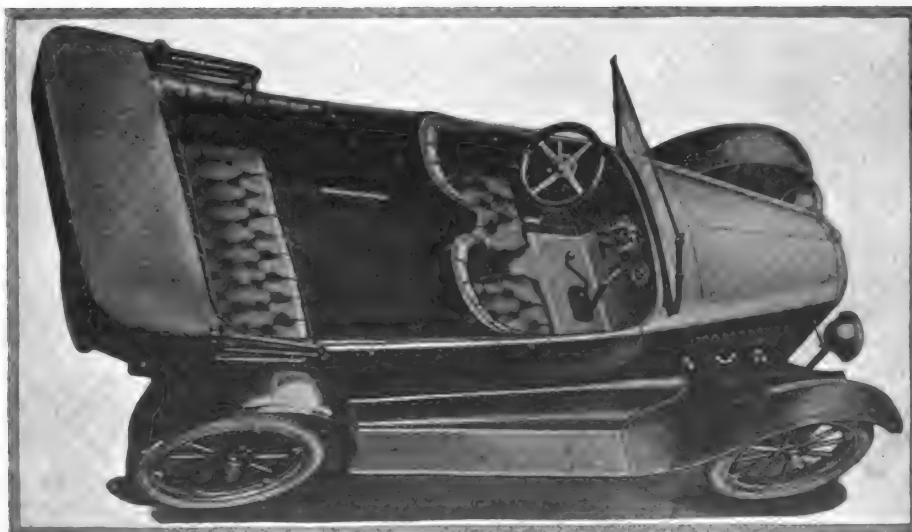
The Unit Power Plant Includes Engine, Clutch and Gearset.

being connected in the usual manner by a pipe through which the fuel is syphoned to the front of the dash, whence it flows by gravity to the carbureting instrument. The main reservoir tank has a gauge to indicate the level of the gasoline therein. Battery ignition with automatic spark advance is employed.

Starting and Lighting System.

The starting and lighting system is a combined unit driven from the crank shaft. The battery is a six-cell storage installation of 80 ampere-hour capacity and rated at six volts. The headlights are equipped with dimmers for city driving, while the tail light is wired in series with the dash light, the latter acting as a "tell-tale" on the tail light.

The power plant is in unit, embracing the engine, clutch and gearset. The clutch is a leather faced cone mounted on an aluminum casting, which has a nominal diameter of 12 inches and $2\frac{1}{4}$ -inch face. The gearset has three speeds forward and reverse and is of the selective type. The main shaft is a solid chrome vanadium steel forging, as are the $\frac{3}{4}$ -inch faced gears, which are heat treated and ground. The main shaft is carried on annular ball bearings, which



Both Hollier Models Are Very Roomy and Easy Riding.

Hollier Discloses a The Best Features of the peated in the New Model, Refined and Improved for

eter, is carried on three main bearings, which are die cast white metal and before mounting are ground to a mirror like finish on the contact surfaces. The cam shaft is of a special steel and the cams are integral.

Lubrication is a gravity and splash system, with a sight feed on the dash, the cylinders, pistons, etc., being fed by oil being splashed by the connecting rods. The cooling system follows the conventional thermo-syphon practise, aided by an ample size radiator, which has the added virtue of attractiveness.

Gasoline is fed to the Stewart duplex carburetor by vacuum from a 14-gallon tank on the rear of the frame, the tank

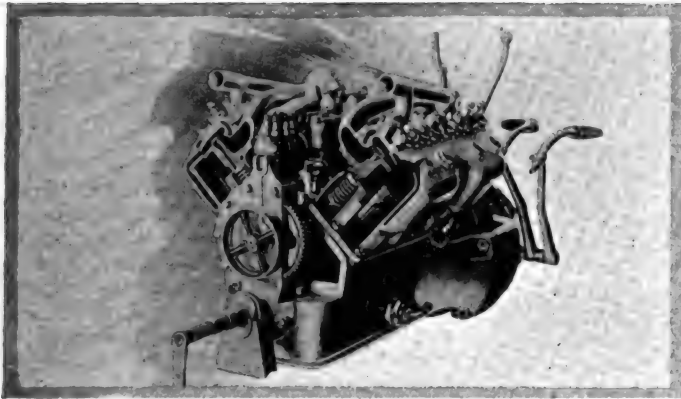
New Model, a Six.

1916 Hollier Eight Are Re-While the Eight Has Been the 1917 Selling Season.

type is also used for the front end of the secondary shaft, the rear end bearing consisting of a bronze bushing babbitt lined. All control pedals and gear and brake levers are mounted on the transmission case, and not on the frame.

The Propeller Shaft.

The drive shaft is practically horizontal under normal load. The universal joint is completely enclosed with casings capable of adjustment for wear. The rear axle is full floating, with solid swaged tubes, pressed into a malleable housing. Driving gears with tooth face width of $1 \frac{5}{16}$ inches are used in connection with a four-pinion bevel differential. Annular ball bearings are used throughout.



A Notable Feature of Hollier Motors is Accessibility.

At the front the axle, an I-beam type, has spring seats forged integrally. The tie rod is at the rear and stops are provided to limit the movement of the steering knuckles.

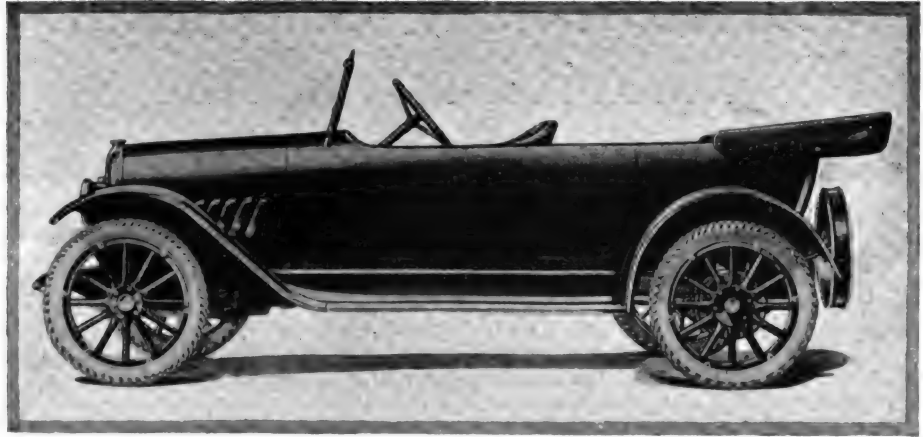
The front set of springs are semi-elliptics, 36 inches long, while those at the rear are full cantilever, 42 inches long, of the double main plate type. Both sets are fitted with integral grease cup bolts.

Braking System.

The brakes operate directly on the rear wheels, on 12-inch steel drums. They are internal expanding and external contracting on the single set of drums and are lined with asbestos fabric.

The wheelbase of the Hollier Six is 116 inches, and the road clearance 10 inches. Twelve-spoke artillery wheels are standard, they being of hickory and fitted with straight side demountable rims and 33 by four-inch tires, non-skids on all four wheels.

The instrument board carries a combined electric lighting and ignition switch, auxiliary spark and throttle buttons, oil gauge, small dash light, mag-



The Nearly Horizontal Lines Are Very Distinctive.

netic type speedometer, while the rest of the board is covered with black leather, presenting an attractive appearance. The control levers are all in the centre of the compartment and the starting button is very handy to the driver's heel. The clutch pedal is adjustable as to length.

Two standard bodies are furnished, a five-passenger touring car and a four-passenger roadster. Both bodies are upholstered in genuine leather and curled hair and are complete in all details, including foot rest, robe rail, door pockets, top, side curtains, top cover, etc., at the regular price. Standard equipment includes speedometer, demountable rims (one extra), motor driven horn, ventilating windshield, 10-inch head-lights, tail light with license bracket, tool kit, jack and tire tools.

AUTO DEVELOPS INTELLECT.

William L. Hughson, president of the Pacific KisselKar branch, recently gave a very interesting interview on the psy-

chology of driving a motor car.

"I am firmly convinced," says Mr. Hughson, "that driving a motor car has a strong tendency to make one's mind more nimble and that it brings about a correlation between mind and muscle that is equaled by very few devices of man and surpassed by none. Driving brings into action muscles which are ordinarily slow and awkward when called upon in emergencies."

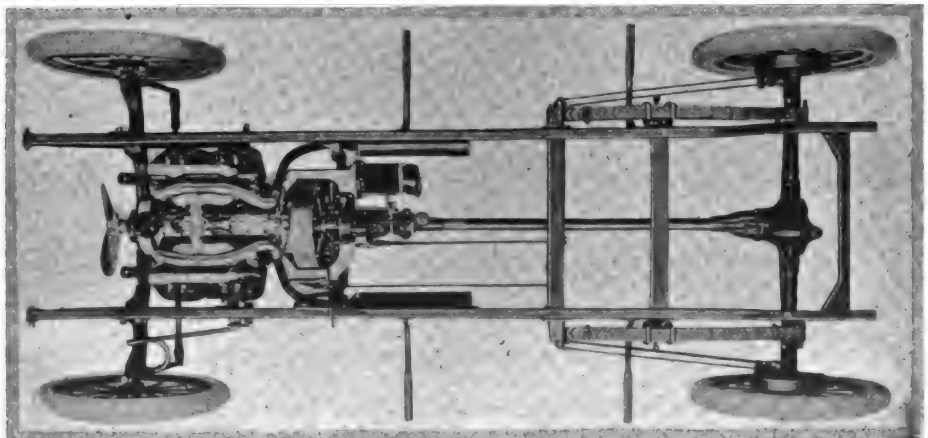
RAYFIELDS ON JEFFERYS.

The Rayfield carburetor has become standard equipment on the Jeffery Six. The addition of the Rayfield carburetor has greatly increased the flexibility of control and economy of operation. While giving maximum power it can be throttled down easily.

RECORD RUN IN PEERLESS.

C. L. Butler of Berkeley, Cal., in a Peerless Eight, made a record run in the Yosemite valley, going from Oakland to the valley and return in 19 hours and 15 minutes, a trip which ordinarily is made in two days by tourists.

Following this run Butler made a gasoline test with his Peerless, carrying five passengers over ordinary roads from Berkeley to Sacramento, a distance of 108.9 miles, on six gallons of gasoline. He drove with both top and windshield up.



The Spring Assembly Is the Same on Six and Eight.

AITKEN'S STAR IN ASCENDENCY.

Takes All Three Harvest Races, and Wins 300-Mile Event at Cincinnati.

Johnny Aitken, in a Peugeot, swept the field clean at the Harvest automobile racing meet at the Indianapolis speedway on Sept. 9, taking the three events, a 20, a 50 and a 100-mile race. The main event, the 100-mile race, was being hotly contested by both Aitken and Rickenbacher, in a Maxwell, when the latter's right rear wheel collapsed, two laps from the finish. Aitken's time was 1:07:06.4, an average of 89.44 miles an hour. Hughie Hughes, Wilbur D'Alene and George Buzane finished in the order named.

Aitken led the field practically all the way in the 50-mile race, which he finished in 32:40:33, an average of 91.83 miles an hour. Hughie Hughes was second, D'Alene third and Louis Chevrolet fourth.

In the 20-mile contest, which was the first on the programme, Howard Wilcox, driving a Premier, gave Aitken a close race up to the finish. Aitken made his best time in this event, finishing in 12:37:35, an average of 95.08 miles an hour.

Johnny Aitken also won the 300-mile sweepstakes at the new Sharonville track in Cincinnati, O., on Sept. 4, capturing a purse of \$13,000. Wilbur D'Alene was second and Frank Galvin third. Dario Resta, the favorite, was in the leading bunch up to the 294th mile, when engine trouble forced his retirement. Ralph De Palma also went out with engine trouble, a broken connecting rod putting him out on the 14th mile.

In a bad spill both Gilbert Anderson and his mechanic, Bert Shields, suffered serious injuries. It occurred in the 168th mile, when Anderson's car skidded

on the stretch and dove into the fence, turning turtle. He was dangerously injured and Shields suffered a fracture of the thigh and internal injuries and the physicians who examined him thought they would prove fatal.

Aitken's average speed for the race was 97.06 miles per hour, his Peugeot covering the course in three hours, five minutes and 27 seconds. There was a total of \$30,000 offered in prize money.

Considerable interest was shown in the race, as it was the first big event to be run on the new track, which is of unique construction. It is made of two by four oak sticks laid lengthwise, with a space of three-quarters of an inch between each plank. This space, according to the originators of the plan of construction, lessens the tendency of the tires to become overheated.

SPEEDWAY BANKRUPT.

The Twin City Speedway at Minneapolis, Minn., has been placed in the hands of a receiver. Phil Herzog of St. Paul has been authorized by the courts to sell the plant as a whole or in parcels.

Lack of patronage caused the failure of the enterprise, which cost over \$600,000. It was a two-mile concrete oval and was the first of its kind constructed in America.

OLDFIELD'S NEW CAR.

Barney Oldfield, the famous race driver, will appear in the Vanderbilt Cup and International Grand Prize races at Santa Monica, Cal., on Nov. 16th and 18th with a new car which has been called the "Car of Mystery." His old De Lage has been equipped with a new mo-

tor built by Harry Miller, a Los Angeles automobile engineer. This engine has 16 overhead valves, operated by an overhead cam shaft. All working parts are completely enclosed, including the magneto and carburetor and oil lines, the latter being cast integral with the crank case.

KILLED AT KALAMAZOO.

Marion Arnold and Jack Peacock, two well known racing car drivers, were killed and several other drivers and mechanics seriously injured in the 100-mile race at Recreation park, Kalamazoo, Mich., on Aug. 27. The event was abandoned.

Peacock's Sunbeam turned turtle after rounding the first turn of the second mile and despite the efforts of the officials to flag the other cars, 11 machines piled up in a heap against the overturned machine. It was the worst mixup ever witnessed on an American race course. Andy Burt of Chicago, driving a Stutz, was the first one to hit the Sunbeam, and his mechanic, Marion Arnold, also of Chicago, was decapitated, meeting instant death. Peacock, whose home was in Brooklyn, N. Y., died shortly after reaching the hospital. His mechanic, F. E. Marquette of Kalamazoo, was in a dying condition when carried from the track.

Of the 14 automobiles that started in the race 11 machines piled up in the mixup. Harold W. Downs, a driver of Kalamazoo, was cut about the face and head, and Roy Newton, his mechanic, also of Kalamazoo, received similar injuries. Thomas Ball of Coldwater, Mich., a driver, had his back seriously injured, and Guy Bailey, of the same town, Coldwater's mechanic, had his back hurt and his face cut. Jimmy Alexander of Sioux City, Ia., and Andy Burt and Otto Henning of Chicago also received injuries, but they were of a minor nature.

Recreation park was the scene of another bad accident in 1908, when Leo Oldfield's racing car ploughed through the fence, killing eight people.

PAIGE-DETROIT PLANS.

The Paige-Detroit Motor Car Company has introduced an exclusive line of Paige enclosed cars for 1917. They are built on the seven-passenger "Six-46" chassis and include a touring sedan, a coupe, town car and limousine. A sedan on the "Six-38" chassis is also offered.

The new models have the distinction of a custom made article, as they are distinctly different and were designed with the object of obtaining individuality to set them apart from the ordinary enclosed types. Particular distinction in design is shown in the Paige touring sedan on the "Six-46" chassis, which has a sliding pointed windshield. It has two doors, the front seats being divided to allow passage into the driver's compartment. Besides the regular dome light there are reading lamps to illuminate the rear seats.

These are finished in 10 different types of upholstery, including a wide variety of imported cloths and tapestries.



SCRIPPS-BOOTH EIGHT WITH WINTER TOP.

New Detachable Winter Top Supplied with Scripps-Booth Eight for \$1350—Car Without Top Comes for \$175 Less—Top Fits Snug to Body with Flush Sides and Does Not Rattle—Windows Are Removable and Interior Is Finished in Soft Gray Whipcord and Has Dome Light.

Motoring Clothes for Early Winter Days.



Leopard Skin a Favorite This Year. This Coat Has Smart Flare, Cuffs of Taupe Fox and Huge Collar. (Revillon Freres, N. Y.)



The Back of Coats Is the Marked Feature in This Fall's Models. Waistline in This Coat Descends from Empire to Natural Lines Under Arms. Note Wide Cuffs. (Oppenheim & Trebitsch, N. Y.)



Smart Top Coat in Dark Gray Velour de Laine and Military Cape of Seal. (J. M. Gidding & Co., N. Y.)



Short Sport Coat in Seal with Deep Border, Cuffs and Roll Collar in Chinchilla Squirrel. (Revillon Freres, N. Y.)

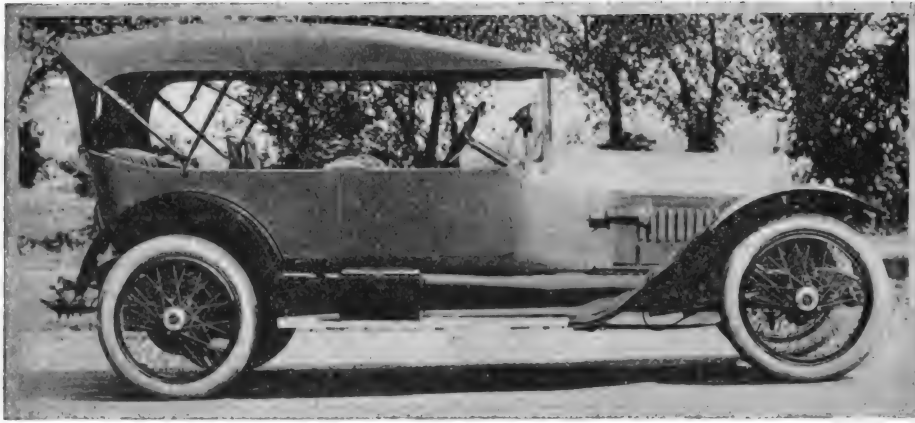
Motor Coat of Green Velour de Laine, with White Trim. Collar and Cuffs of White Pontine, a Waxed Fabric. (Franklin Simon & Co., N. Y.)



Green Worsted Coat Lined with Two-Tone Green Pussy Willow Taffeta, Yellow and Purple Striped. (H. R. Mallinson & Co., N. Y.)



Photographs by Joel Feder, New York



The New Stutz, Showing Its Graceful Lines.

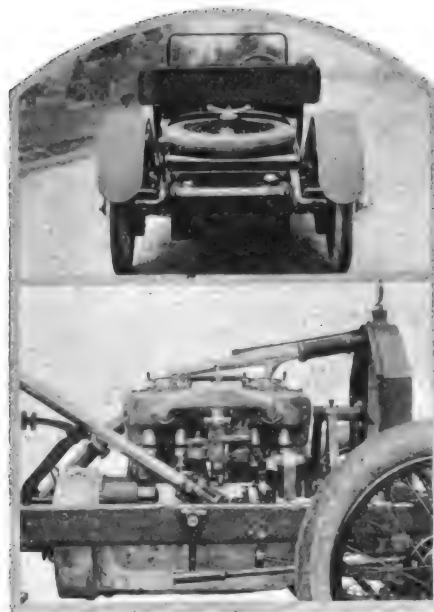
THE new series "R" announced by the Stutz Motor Car Company of Indianapolis, Ind., will all be made on the same chassis, 130-inch wheelbase, with a four-cylinder motor and right hand drive. While facilities have been doubled at the Stutz factory in the past year, there will be no attempt at production records, the policy of manufacturing a highly finished and serviceable car, putting quality before quantity, being continued.

There will be three models put on the market, the four and six-passenger Bulldog Specials and the Stutz roadster. In place of the cowl cabinet and thermos bottles which were installed in the six-passenger Bulldog Special, special auxiliary seats are part of the equipment, as in the four-passenger model. These seats fold up neatly against the back of the front seats, making the tonneau very roomy.

The length of the body in the six-passenger Bulldog Special has been increased four inches, as compared with last year's model of the same type, and the width has been extended one inch. Crowned fenders are used and the finish is of exceptional quality throughout. The bodies on all the models are upholstered in either brilliant finished long grain hand buffed black leather, or the finest quality of dark brown Spanish hand buffed leather. Battleship gray and Mercedes red have been adopted as standard Stutz colors on all the cars. The price of the Stutz Bulldog Special is \$2550 f. o. b. factory.

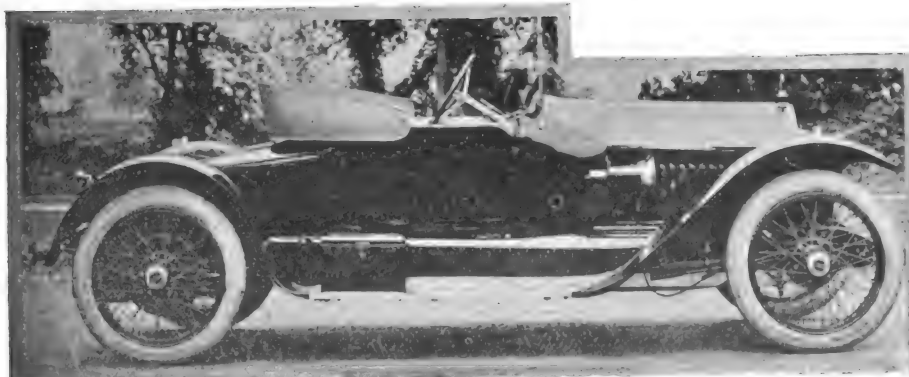
A number of minor changes have been

made in the chassis, but it is in almost every essential identical with that used on the 1916 models. The motor is of the T head type, with four cylinders, $4\frac{1}{4}$ -inch bore and $5\frac{1}{2}$ -inch stroke, and the



At Top, How the Spare Wheel Is Carried on the Roadster; Below, the Stutz Motor.

forced feed oiling system through hollow crankshaft is used. The adoption of a hot water jacket on the intake manifold and a hot air horn, which runs from the exhaust to the carburetor, are the only



The Stutz Roadster, Which Has Baggage Compartment.

Stutz New Series

Three Models, Two Sizes of Roadster Type, Are To Be Chassis, Which Has Many

changes in the motor. A Stromberg carburetor, Bosch ignition system and Remy starting motor and generator, independent system, make up the motor equipment.

A pressure feed gas tank is located in the rear of the car on the special, while on the roadster it is on the rear deck and the feed is by gravity. A centrifugal pump circulates the water through the cooling system, which is a cellular radiator.

Stutz special transmission is used with a leather faced cone clutch.

Another feature that makes for the maximum comfort of the driver is the new position of the gear shifting lever. In last year's model the high-gear posi-



Stutz Lines Are Extremely Distinctive.

tion was on the inside and toward the driver, which was found to be somewhat inconvenient because the lever was in the way of the driver's leg. This year its position has been reversed, so that when in high it is against the body and out of the way. Another added feature is provision of a padlock for locking the shifting lever in neutral.

Adjustable pedals have also been added, there being provision for a variation of $2\frac{1}{2}$ inches to suit the requirements of the driver. The propeller shaft is enclosed by a torque tube which attaches to a face plate back of the clutch.

In place of the goose necks that were used, forgings are employed to extend the frame in back and it has been increased to a width of five inches on the side and $3\frac{1}{2}$ inches in the centre. The gusset plates are integral with the side bar.

The front springs are semi-elliptic of special alloy steel. The riding qualities have been greatly improved by the use of a longer rear spring, which lies flat under full load and gives an almost perfect straight line drive through the double universal joints. The rear springs

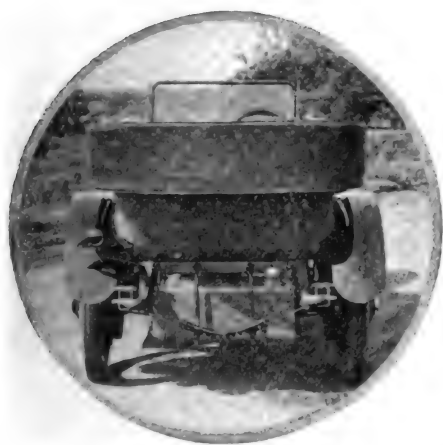
"R" Announced.

Bulldog Specials and One Mounted on the Same Size Improvements in the Details.

have been increased six inches in length to 56 inches and are fitted with Hartford shock absorbers as regular equipment on all models.

All of this year's models will be equipped with Houk wire wheels, 34 by 4½ inches, an extra wheel being included without extra cost. It is optional with the buyer whether the car is fitted with either Goodrich, Silvertown Cord or Goodyear Cord tires. The front axles are Timken and the rear set of a special Stutz design, as used last year.

The accessories that come with the car as part of the regular equipment include a Boyce motometer, windshield, spotlight and double bulb lamps, with small bulb out of focus with which the lights may be dimmed.



The Spare Wheel Carrier on the Bulldogs.

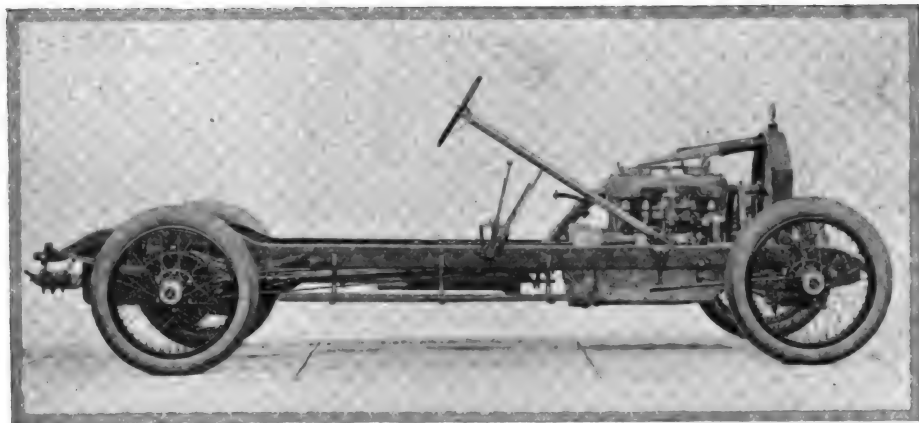
The Stutz roadster, on the same chassis as the Bulldog Special, has a large and roomy body, with a capacious carrying space in the rear, holding two or three suit cases. A seat for the extra wheel is provided for in a circular depression on back which holds the wheel snugly in position and gives the car an extremely classy appearance. The holding device has a special padlocking arrangement to prevent the wheel from being stolen.

The Stutz roadster sells at \$2275 f. o. b. factory.

KING ECONOMY TEST.

A fuel economy test carried out with a King eight under the auspices of the A. A. A., under average road conditions as obtained between Chicago, Pittsburg and Milwaukee, showed an average of 14.658 miles to the gallon of gasoline and 962.4 miles to a gallon of oil.

The object of the test was to give the King a gasoline record such as an owner would obtain in touring, and no effort was made to establish a maximum econ-



This View Shows the Rugged Stutz Chassis.

omy record. T. P. Chase, chief engineer of the King Motor Car Company, drove the car, and F. E. Edwards of the American Automobile Association and his assistant were passengers. Mr. Edwards

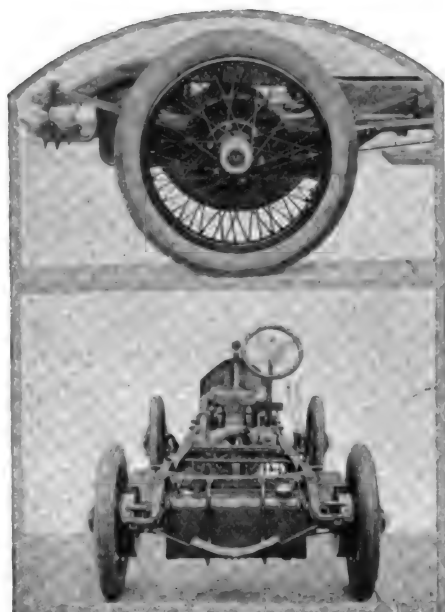
in making a trip. The officials in charge examined the car before the start and at the finish to establish its status as a stock King.

It was a regular seven-passenger, eight-cylinder, with three-inch bore and five-inch stroke, Ball and Ball carburetor, nozzle size 70, Atwater Kent ignition, Ward Leonard electric units, Carter gravity tank.

Only 2.5 quarts of oil were needed to fill the crank case on the arrival of the car in Milwaukee. With baggage and five passengers the weight of the car totaled 4250 pounds. The Firestone tires were not inflated once after the start of the trip and only one gallon of water was consumed in the radiator. The average mileage per hour, including all stops, was 19.44. Excluding all stops the mileage was 22.67. Only seven stops were made between controls, but only one of these made was necessary to adjust a part of the car, and that was because a screw in one of the rear hub caps became loose.

COLE ROAD RECORDS.

H. B. Palms and H. H. Hunter of the Palms Motor Company, drove a Cole stock eight from Long Beach, Cal., to Pine Crest, in the San Bernardino mountains, a distance of 94.7 miles, in three hours and 3½ minutes. This is said to be the best record ever made over this course and the trip was made throughout the entire distance on high gear.

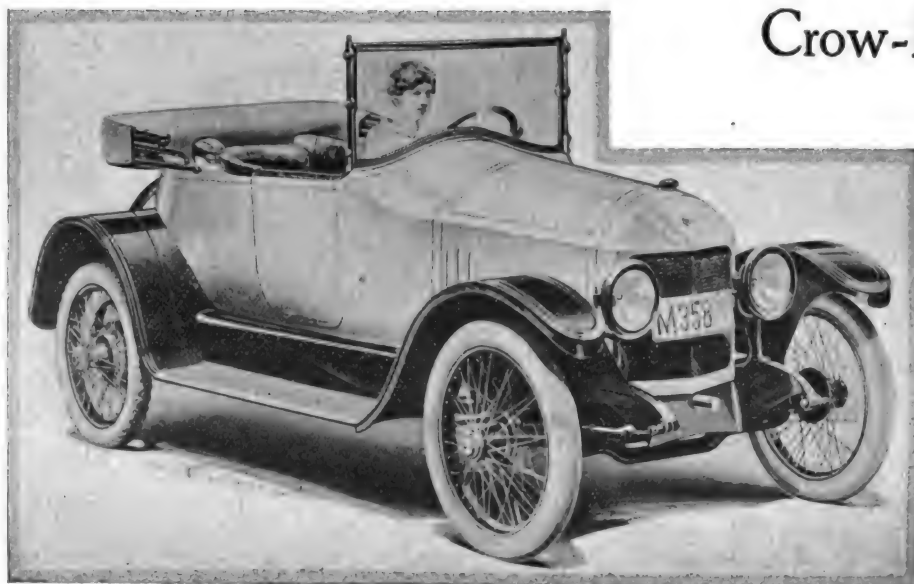


At Top, the New Spring Assembly at the Rear; Below, a View of the Stripped Chassis.

measured the fuel with a graduate to determine to the fraction of an ounce the quantity used. The gasoline was obtained on the highway and was of a quality similar to what any tourist would purchase



Houk Wire Wheels Are Standard on All Models.



The Clover Leaf Roadster.

IN ANNOUNCING a 1917 mid-season model of the Crow-Elkhart "35" to sell at \$795, the Crow Motor Car Company of Elkhart, Ind., has instituted a feature that is sufficiently meritorious to establish it as a custom from year to year, as it indicates a highly progressive policy in affording the automobilist the opportunity of securing the very latest design in motor cars early in the season.

Aside from being the largest car that is retailing for less than \$1000, the new model has many superior advantages, which make it particularly desirable for fall touring and general use. There was little delay in bringing out the new model, as the Crow Motor Company manufactures its own bodies and the new features are mainly incorporated in the body designs. The wheelbase, however, has been lengthened from 112 to 114 inches, to provide for a greater body length. The lengthening of the body by three inches has greatly improved the beautiful streamline effect that is obtained in the new 1917 Crow-Elkhart "35."

Every owner of a car at some time experiences the wish that there was more room in the tonneau of his car to provide for comfortably seating one or two extra passengers, and with this idea in view the new model has been made as capacious as possible, even to the extent of undercutting the body for the fenders and wheels. This design made possible a rear seat in the tonneau 49 inches wide and the lengthening of the body gives ample room for the use of two auxiliary seats without cramping or inconveniencing the occupants of the rear seat. The roominess of this body is apparent at a glance and its advantages are quickly appreciated by experienced owners who have so frequently found need of extra room in the tonneau.

In carrying out the new line effects that have been introduced into this model, a new curved front radiator, new hood and new windshield have been in-



The Front of the Touring Car.

troduced in the design and the whole scheme of lines is blended into a harmonious finish by the use of beautiful domed fenders.

The same chassis principles that have made the Crow-Elkhart famous for its power and reliability during eight years is retained with the 35 horsepower four-cylinder motor. This motor has a detachable head and the pistons contain oil

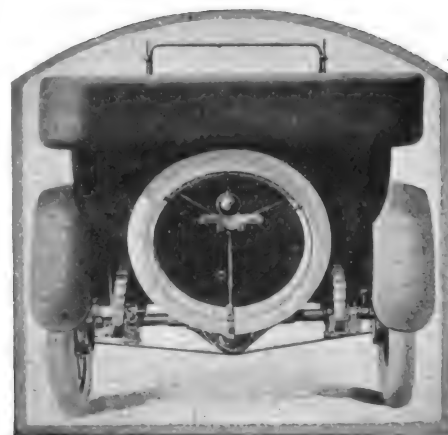
Crow-Elkhart Model "35".

Changes Mainly Concern Body Improvements Though Some Chassis Refinements Appear.

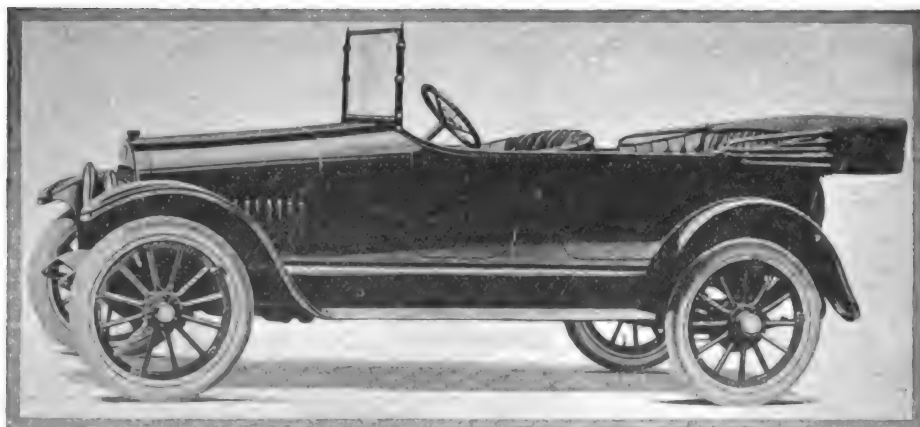
ports for the conservation of the lubricant, preventing it from passing up between the pistons and cylinder walls into the combustion chamber. A great saving in lubricating oil is effected by the use of these ports, which prevent the lubricant from being burned with the fuel oil and passing off in smoke.

Other parts of the chassis, the transmission, dry disc clutch, full floating rear axle, starting and lighting system, are the same as used in the 1916 models. Tires are $3\frac{1}{2} \times 32$ inches. Having shown satisfactory results under road tests in the hands of thousands of owners, the engineers could find no reason for altering either the power plant or other parts of the chassis which have never been the object of any complaints from users. This is the strongest possible testimonial to the serviceability and running qualities of a car.

The three-passenger cloverleaf roadster, which met such a big demand during the past season, is continued on the same chassis at a price of \$725.



The Rear of the Touring Car.



The Mid-Season Crow-Elkhart Touring Car.



CONCRETE block construction has become very popular in the erection of garages, as it has a number of advantages over both the stucco or solid concrete type of structure. It is the most simple and economical kind of building material and yet is subject to unlimited architectural treatment.

The principal factor in constructing a garage of this type is the concrete blocks. They are obtainable almost everywhere, but care should be taken that they are well made, as both the strength and durability of the building will depend upon their quality. There are many types of blocks, including hollow, solid and two-piece, finished with either a rough surface in imitation of cut stone or with a smooth facing like finished granite.

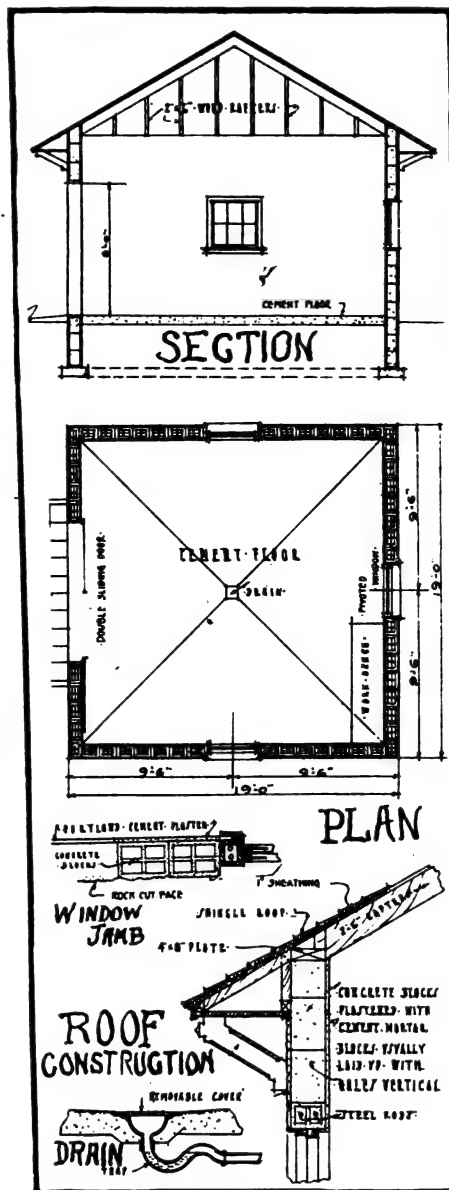
In the building shown in the accompanying illustration both types of blocks have been employed to make an artistic exterior. The corners and openings are framed with smooth-faced Atlas-White blocks and two rows of these are used as the base layer, as well as the caption of the walls, making a pretty and striking contrast with the rough cut blocks.

A varied color scheme may also be worked out with the blocks by using different colors or textures. If the builder is manufacturing his own blocks this may be done by mixing coloring matter with the surface layer of the blocks. They are usually obtainable, however, in many different colors and finishes from dealers in mason's supplies.

The initial work in preparing to erect the garage for which plans are herewith shown is similar in nature to that described in the two preceding issues of *The Automobile Journal* for the stucco and solid concrete types, except that the hollow blocks can also be used in making the foundation walls as well as the remainder of the structure.

The blocks are laid with the holes in a vertical position and after the same manner as cut stone, being set in a Portland cement mortar. Any competent mason can do the work in a satisfactory manner. During the course of construction the frames and door cases may be built in or the sills and lintels can be cast of cement in wooden frames and erected as part of the wall.

A cement, concrete or wooden roof may be used. If a wooden roof is to be put on, as shown in illustration, a plate 4x8 inches is anchored with small bolts or heavy spikes on top of the walls for



Detailed Plans for Building a Concrete Block Garage.

the rafters. The interior walls can be finished off with either stucco or a cement mortar.

Before the floor is laid provision should be made for the drain, which is constructed as shown in an accompanying sketch. The drain pipe may lead either to the sewer or into a French drain, which is made by sinking a barrel containing cinders or some other sub-

stance which will not form into a mass when wet. The barrel should have a number of holes bored in the sides and bottom and be sunk four or five feet under the ground. While the ground is broken up pipes that are to lead in from outside the building should be laid.

Before laying the floor care should be taken to carefully replace the earth and roll and tamp the surface until it is hard and smooth. A solid concrete floor is the best and should be installed in two layers. A first layer of four inches of concrete mixed from one part cement, 2½ parts sand and five parts of broken stone is surfaced with a one-inch coat of cement mortar made of one part cement and two parts sand. The second layer should be laid immediately after the first and before it has a chance to set. In laying the floor it should be sloped toward the centre where the drain is located to carry off all the surface water. This may be done by either giving the floor a moderate concavity or by carrying the incline from the walls to the drain centre with triangular inclined plane surfaces.

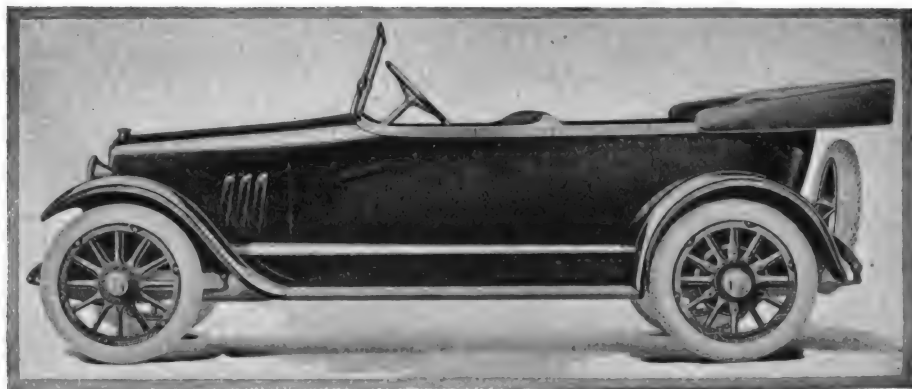
The type of approach to be constructed depends upon the location of the garage and the relative position of the drive way. It should slope gradually and have a secure foundation. When finished the flat effect may be diminished by scoring off in squares or where the red tiles have been used either on the roof or to embellish the walls, a red coloring matter may be mixed with the cement, making the approach harmonize with the general scheme of decoration.

AUTO RECORD BOOK.

"The Automoblist's Pocket Companion and Expense Record," arranged by Victor W. Page, M. S. A. E., is a valuable hand book for every motorist who keeps track of his running expenses and maintenance cost.

In addition to the expense data sheets there is also contained in the book much valuable information on such subjects as lubrication, storage batteries, fuel system, tires and interesting facts in regard to maintaining the motor's power. The book is a collection of facts chosen by an expert as important to the knowledge of a motorist.

Published by the Norman W. Henley Publishing Company, 132 Nassau street, New York City. Price \$1 per copy post-paid.



The Bour-Davis Touring Car, Price \$1250.

THE Bour-Davis Six, made by the Bour-Davis Motor Car Company, one of the automobile companies established in Detroit within the past year, is especially designed for motor car buyers who demand nicety of detail, luxuriousness of appointments and extreme efficiency in mechanism, and at a consistent price. The price of the touring car has been set at \$1250 and the enclosed body type, the only other to be mounted on the six chassis, at \$1500.

Just how the designers have met this anticipated demand is evident in the views of the car shown herewith, they illustrating its extremely pleasing lines and curves. The bodies are quite lavishly equipped for the class in which this model fits. The touring car particularly is a roomy and large "job" and the chassis is made up of standard parts of favorably known equipment and material makers.

The motor is a high speed, six-cylinder Continental, cast en bloc, with bore of $3\frac{1}{4}$ and stroke of $4\frac{1}{2}$ inches, and a total piston displacement of 224 cubic inches. The cylinder head is removable and all valves are enclosed by an oil-tight side plate. To insure against distortion of the camshaft, a feature essential to the efficient operation of a motor, this member is provided with ample size bearings of the following dimensions: Front $1\frac{1}{8}$ " x $2\frac{1}{4}$ ", centre, $1\frac{13}{16}$ " x $2\frac{1}{4}$ ", rear $1\frac{11}{16}$ " x $2\frac{11}{16}$ ". The cams have wide faces of $\frac{3}{4}$ inch and the shaft is driven by helical gears.

The crankshaft runs in three large

bronze backed, babbitt lined bearings, the dimensions of which are, front $2\frac{9}{32}$ " x $2\frac{1}{2}$ ", centre $2\frac{1}{4}$ " x $2\frac{7}{8}$ ", rear $2\frac{7}{32}$ " x $2\frac{15}{16}$ ".

The connecting rods run in bushings at both ends, that at the piston end being of bronze and at the shaft end die-cast babbitt. Each connecting rod and piston assembly is weighted and balanced by each other to promote smooth and quiet running.

Lubricant is fed to the bearings and troughs by a cam operated pump and from there is splashed to the various bearing surfaces within the engine. The capacity of the steel oil pan that forms the bottom of the motor is five quarts, and the amount in the pan is always indicated by a dial. Oil pressure is observable by a gauge fitted to the instrument board.

Cooling is by pump circulation and the V shaped radiator is given an added efficiency by the employment of numerous fins and plenty of air passages. The fan is belt driven, the tension of the belt being adjustable.

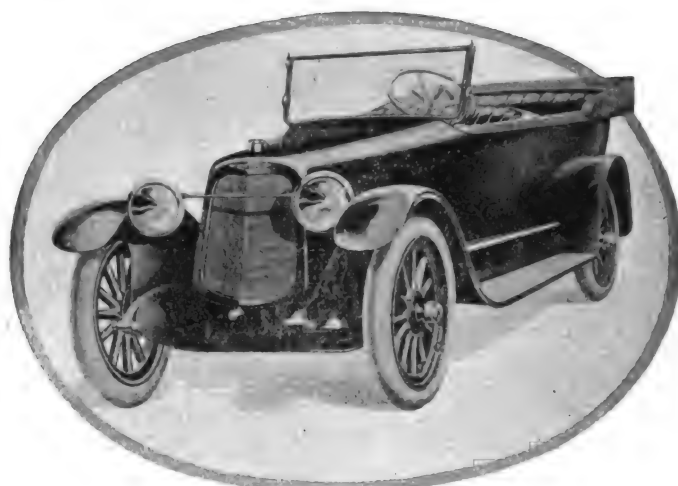
The ignition system consists of Remy

Bour-Davis Six

Luxurious Coach Work and Are Outstanding Features—Models Disclose High Me-

high-tension coil and distributor. Starting and lighting is by a two-unit, Ward-Leonard installation, the starting motor driving through teeth on the flywheel and the meshing and demeshing of the starter pinion and the flywheel teeth being by the Bendix automatic device. The generator is driven by the front gears and connects to a six-volt, 80 ampere-hour battery.

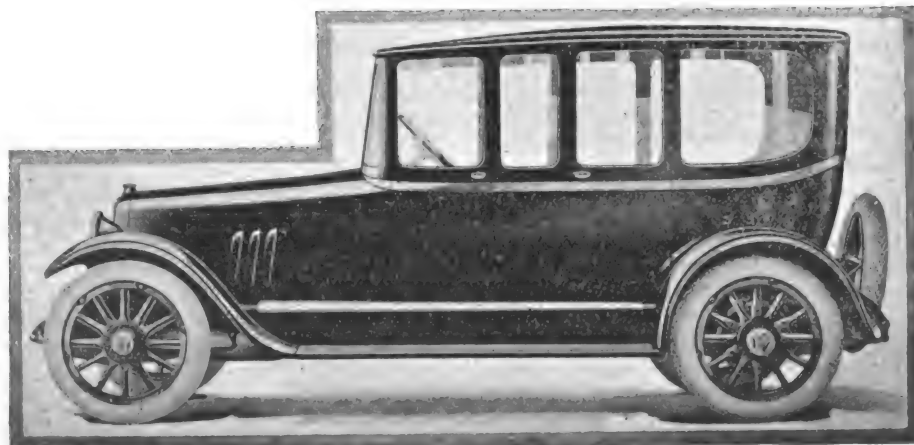
The gasoline system includes a Stromberg horizontal outlet carburetor with a Stewart vacuum feed tank mounted on the front of the dash. The fuel is contained in the main tank of 17 gallons capacity, carried on the rear of the car and mounted on three-point suspension and cushioned by coil spring.



The Touring Car Is Very Distinctive.

The transmission is a Detroit Gear and Machine Company product. There are three speeds. The engine drives through a 10-inch Borg and Beck disc clutch and the compact unit gearset, the gears and shafts of which are of chrome nickel steel and the shaft mountings are annular ball and Hyatt roller bearings. There is provision for compensating for any wear that may develop. A spool type of countershaft with stationary spindle is employed to insure smooth and noiseless action and prevent oil leakage. The transmission shaft drives the speedometer gear. The propeller shaft is provided with two universal joints, which, combined with the Hotchkiss drive, gives the chassis great flexibility.

Nickel steel spiral bevel gears are used in the three-quarter floating rear axle to promote smoothness and silence in operation. The rear ends of the springs, which are 52 inches long, self-lubricating, semi-elliptics and underslung, are held down by the rear ends of the frame rails being bent down, thus providing a low mounting for the car. The main leaves of the springs are of a special chrome



Bour-Davis Closed Car, Selling for \$1500.

A Distinctive Car.

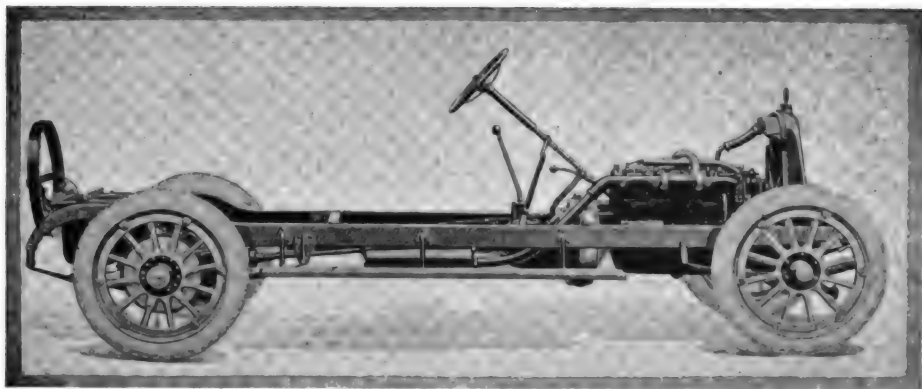
Arrangement of Equipment
Assembled from Standard Parts
Mechanical Working Efficiency.

vanadium steel to insure strength.

The emergency brake, of the expanding type, and the service set, of the contracting type, act on the 14-inch rear wheel brake drums through an auxiliary shaft, which eliminates any jarring that may be caused by spring action. Both sets have efficient equalizers.

Wheels are wooden, artillery type, 32 inches in diameter, with 12 embossed spokes to give strength to the assembly. Demountable 32x4 rims, non-skid tires on the rear, complete the equipment.

The wheelbase of the five-passenger touring model is 118 inches, and the frame is tapered gracefully from rear to front to provide ample turning radius. Front and rear seats are very roomy, the



Stripped Chassis Shows Strength and Neatness.

man type with Collins curtains that operate when the doors are opened.

CHALMERS EDITS "CHALK TALK."

The new house publication of the Chalmers Motor Car Company, which is entitled "Chalk Talk," is being edited by Hugh Chalmers, president of the company.

In bringing out "Chalk Talk," Mr. Chalmers says, "I am simply aiming to extend the cordial personal relations between dealers and factory executives, which is so desirable an asset in modern business. According to my present plans the booklet will be devoted to a frank discussion of the dealer's problems and their solution, wherever possible. We have invited our distributors and dealers to

send in their suggestions and intend to make the little journal a clearing house for the newest ideas in salesmanship."

It is the intention of Mr. Chalmers to keep "Chalk Talk" up to the high standard established by "Chalmers Clubman."

CHEVROLET AT \$490.

William C. Durant, president of the Chevrolet Motor Company, has sent out an announcement to dealers of the cut in price which has become effective on the Chevrolet for 1917. The model 490, which formerly sold at \$550, is now being offered at \$490, fully equipped, with a standard two-unit electric lighting and starting system built into the car.

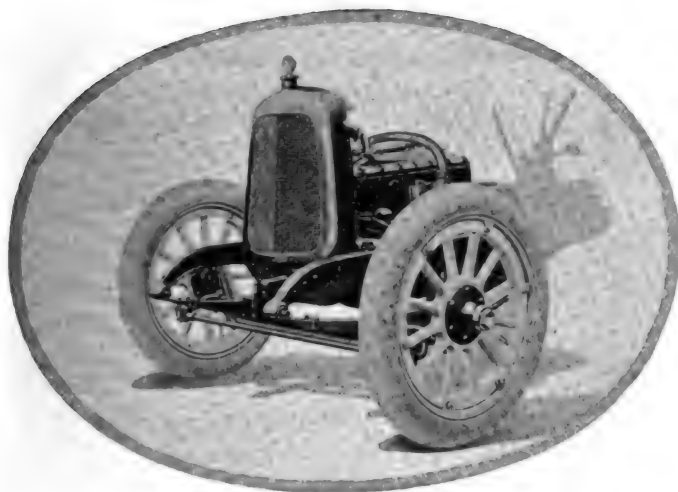
The manufacturers claim the Chevrolet is now the lowest priced electrically lighted and started automobile in the market.

ALLEN "ALL-AROUND" TEST.

An Allen car was recently put through an all-around test in Washington, D. C., with very favorable results. Tests of hill climbing, throttling down and getaway, with an incidental gasoline consumption test, were made. Road conditions were of the average and the car covered 27.2 miles with a gasoline consumption of one gallon and two gills during the 55 minutes the tests lasted.

HUDSON 24-HOUR TEST.

The Hyatt Roller Bearing Company of Detroit, Mich., has issued a small folder, showing 15 illustrations of the 24-hour test made by Ralph Mulford in the Hudson Super-Six equipped with Hyatt roller bearings. Mulford drove 1819 miles at an average speed of 75.8 miles per hour.

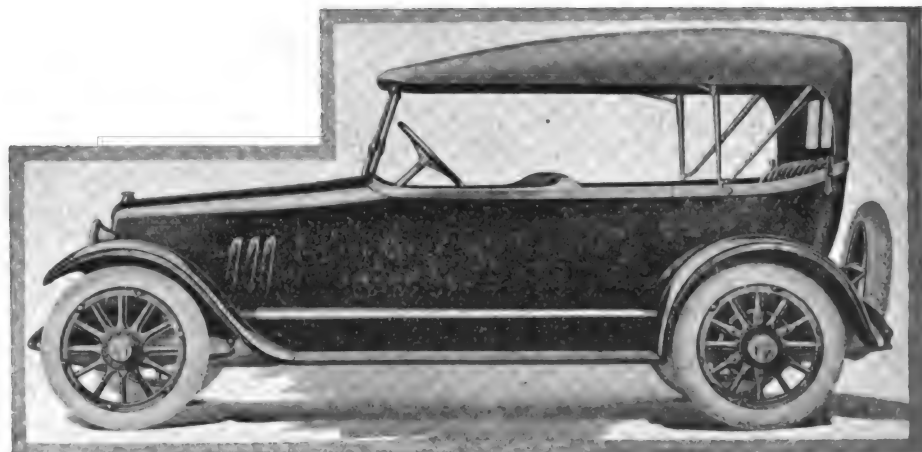


The Six-Cylinder High-Speed Motor.

seats being at an angle and so shaped that the passenger experiences the greatest comfort.

The coach work and general design of the body is luxurious in the extreme. The lines show a streamline adaptation with high, sloping bonnet and slightly rising cowl, which is accentuated by a second cowl behind the driver's compartment. The trim lines are emphasized by a smooth, raised panel of a second color than that of the body in general, this panel being 1½ inches high. The windshield is set at a rakish angle and is of the latest rain vision, ventilated type.

The instrument board is finished in walnut and the back of the front seat is very attractively paneled, which adds to the general distinctiveness of the car. The regular equipment includes a roomy luggage trunk at the rear, Boyce motorometer for determining the temperature of the water, rear vision mirror, windshield cleaner, a combination dash and trouble light with 18 feet of cord for use in seeking troubles at night, as well as the equipment usually supplied with high grade motor cars. The top is a one-

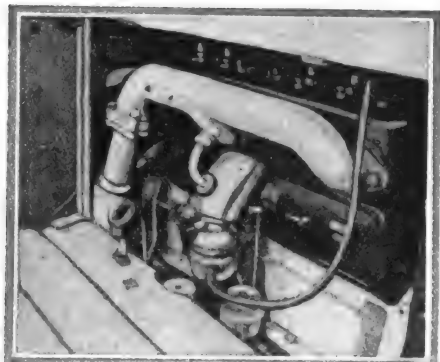


The Touring Car Model with Top Up.

ENGLISH KEROSENE CARBURETOR.

An Instrument In Which Both Gasoline
and Kerosene Are Used With Success.

In the light of recent and persistent agitation on the subject of kerosene carburetors, the mixture device known as the Smith-King paraffin carburetor,



The Smith-King "Paraffin" Carburetor on the Engine of a Two-Ton Burford Truck.

which has just been introduced in England, seems to have interesting possibilities, it being understood that "paraffin" is the English equivalent of kerosene.

This device is adapted to handle both gasoline, or "petrol," and kerosene, but instead of operating with these alternately, as has been the practise in other attempts to use kerosene, they are fed simultaneously. A separate float chamber is provided for each fuel, the gasoline chamber having connection only with one of the four jets employed, this being the starting and idling jet. This is not shut off when the throttle is opened, as in the Longuemare and some other foreign types, but continues to function at all throttle positions, so that some gasoline is used continuously. However, the amount is relatively small as compared to that of the heavier fuel which passes through the larger openings of the other three jets, especially in the case of a truck motor, which is continuously operated with fairly large throttle opening.

When, as on slight down grades, the throttle is closed almost to the idling position, the proportion of gasoline to kerosene is greatly increased, quite automatically. This would seem to be a very practical arrangement, since such a condition is very unfavorable to kerosene carburetion, on account of low compression pressure, low air velocity and reduced supply of heat to the jacketed atomizing chamber.

HAYNES ROADSTER.

A new four-passenger roadster on either the Haynes "Light Six" or "Light Twelve" chassis is being marketed by the Haynes Automobile Company of Kokomo, Ind., as a successor to the Haynes three-passenger "So-Sha-Belle" model.

The tonneau is exceptionally roomy and is formed to give the occupants

plenty of leg room. An aisle between the front seats gives the body a very chummy effect and the rear seat, which is designed for two persons, is sufficiently wide to accommodate three, making the car a five-passenger machine if desired.

Hand buffed leather is used in the upholstery and the seats are covered with water proof seat covers of soft gray cloth. The control instruments are grouped on an instrument board and are within easy reach of the driver.

Both chassis have 121-inch wheelbase, with a turning radius slightly under 21 feet. The 12-cylinder roadster has cord tires, shock absorbers and wire wheels as regular equipment.

SCRIPPS-BOOTH RECORD.

A Scripps-Booth car in a six-day, non-stop run held in Denver, Col., showed an average mileage of 30.58 miles per gallon. The car was run by Jas. A. Nisbet and was driven over all kinds of roads and under every conceivable condition it was possible to operate a motor car. A total of 1942 miles was covered in the six days, with a gasoline consumption of 63½ gallons.

SALESMEN USE OVERLANDS.

One large tire manufacturing concern, which has about 275 Overland cars in use by its salesmen, finds that the men can cover much more territory than when they were depending upon the steam and electric trains to get from place to place. It was also found that the expense was comparatively light, the records kept by the company showing that the entire fleet of cars in use, including a number of model 75-B Overlands, covered 170,337 miles in 30 days at

an average cost of .066 per mile. Included in these costs are depreciation of 30 per cent. the first year, all cost of operation, repairs, new tires and the cost of insurance.

COMING EVENTS

September.

Show, Milwaukee.....Sept. 11-16
Race (track), N. Yakima, Wash..Sept. 18
Show, Oklahoma City.....Sept. 23-30
Show (state fair), Salem, Ore. Sept. 25-30
Race (track), Trenton, N. J....Sept. 29
Race (speedway), New York, Sheepshead Bay Speedway,.....Sept. 30

October.

Convention, National Association Automobile Accessory Jobbers, St. Louis.....Oct. 2-5
Race (speedway), Omaha, Neb..Oct. 7
Race (speedway), Philadelphia..Oct. 7
Show, Troy, N. Y.....Oct. 7-14
Race (speedway), Chicago.....Oct. 14
Show, Dallas, Tex.....Oct. 14-31
Race (speedway), Indianapolis..Oct. 19
Race (track), Kalamazoo, Mich..Oct. 21
Tour, Commercial Car Reliability, Los AngelesOct. 21-22

November.

Race, Vanderbilt Cup and Grand Prix, Santa Monica.....Nov. 16-18

January, 1917.

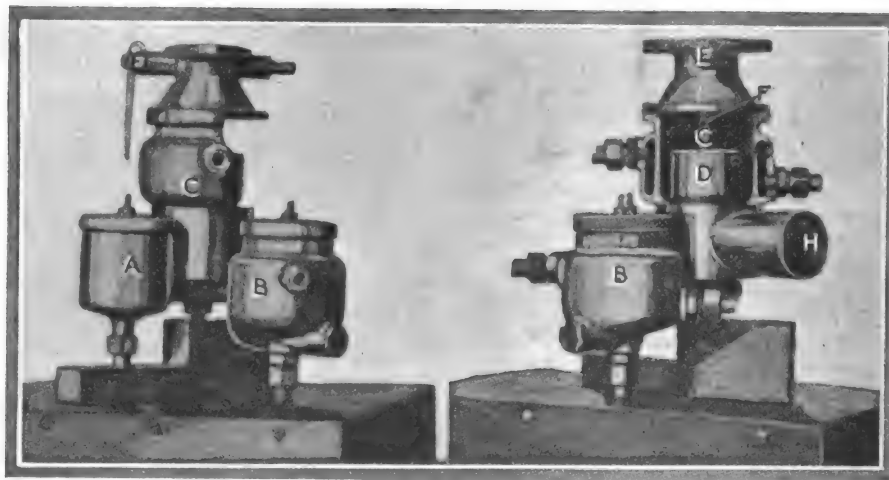
Show, New York City.....Jan. 6-13
Show, Cleveland, O.....Jan. 13-20
Show, Montreal, Que.....Jan. 13-20
Show, Chicago.....Jan. 27-Feb. 3

February.

Show, Newark, N. J.....Feb. ...
Show, St. Louis, Mo.....Feb. ...
Show, Omaha, Neb.....Feb. 26-March 3

March.

Show, Boston, Mass.....March 3-10



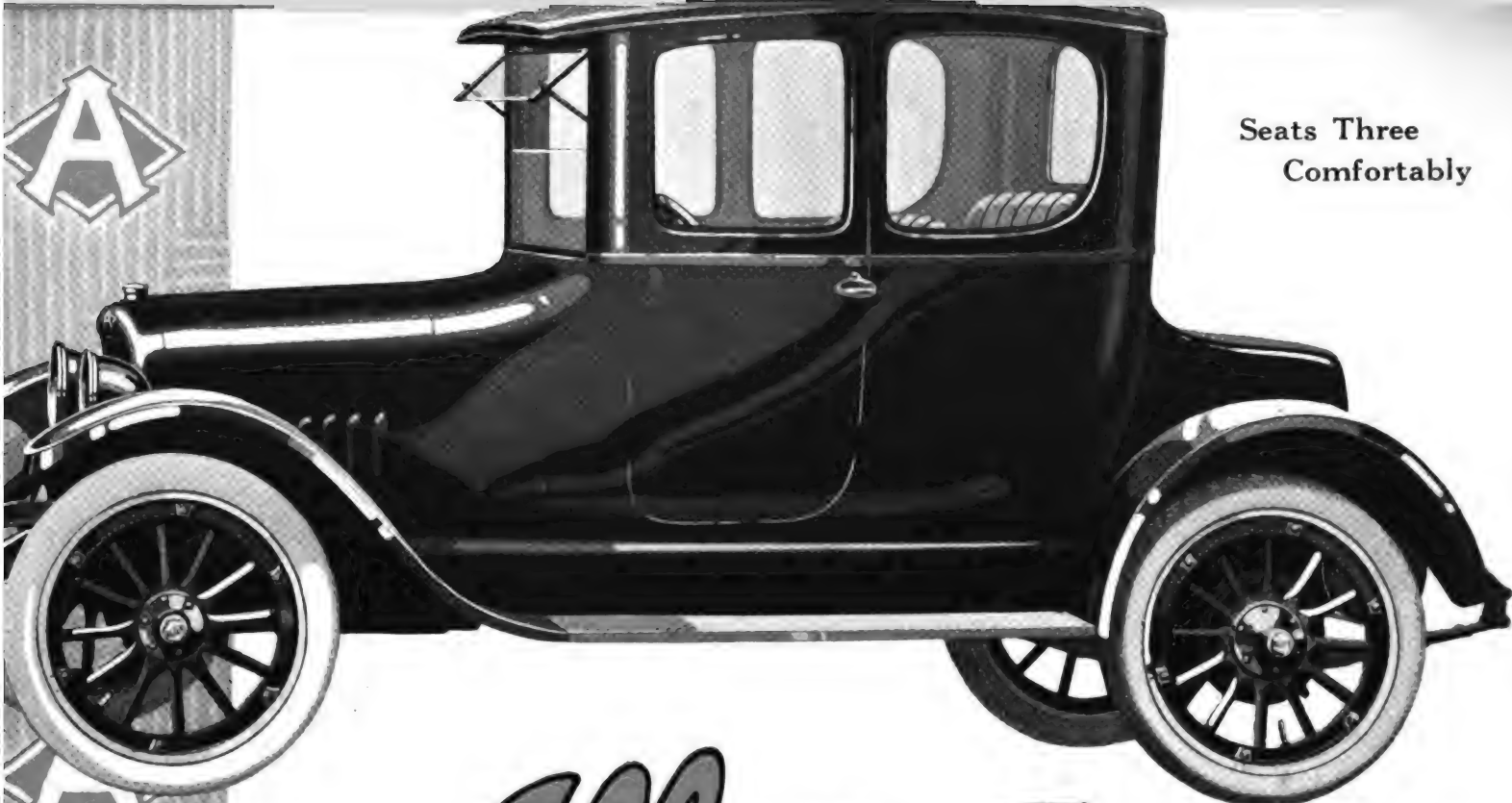
Sectional Model of the Smith-King "Paraffin" Carburetor Attachment: A, Gasoline Float Chamber; B, Kerosene Float Chamber; C, Passage for Mixture, containing Automatic Dashpot; E, Throttle; F, Passage to Central Tube; G, Choke Tube; H, Air Intake.

Announcing *Allen*

*Closed
Cars*
1917



Read Particulars Within



Seats Three
Comfortably

Allen Coupe \$1075

ALLEN CLOSED CARS

**Make a Good Dealer Proposition a Still
Better One**

The Allen dealership has always been a money-maker.

This can be proved and there are sound reasons why it is so.

The Allen Touring Cars and Roadsters are among the very biggest values in cars selling under \$1000—\$795 for Model 37 and \$850 for the Classic model.

And now come two closed cars, bigger values than ever before offered—a convertible Sedan at \$1095, and a Coupe at \$1075. These are 112 inch wheelbase cars with 33"x4" tires.

Look over what the market offers and you'll find no closed cars that sell for so little additional charge for closed models, in proportion to the price of open models.

**We are talking now of full fledged closed cars,
not about cars with the semi-rigid closed tops
offered by some makers.**

Distinguished in Appearance

And these Allen Closed Cars are beauties. Their lines have dignified grace and charm.

In appointments, in upholstery, in finish they measure up to a high standard. They are, in fact, much finer than you would expect in cars of so moderate price.

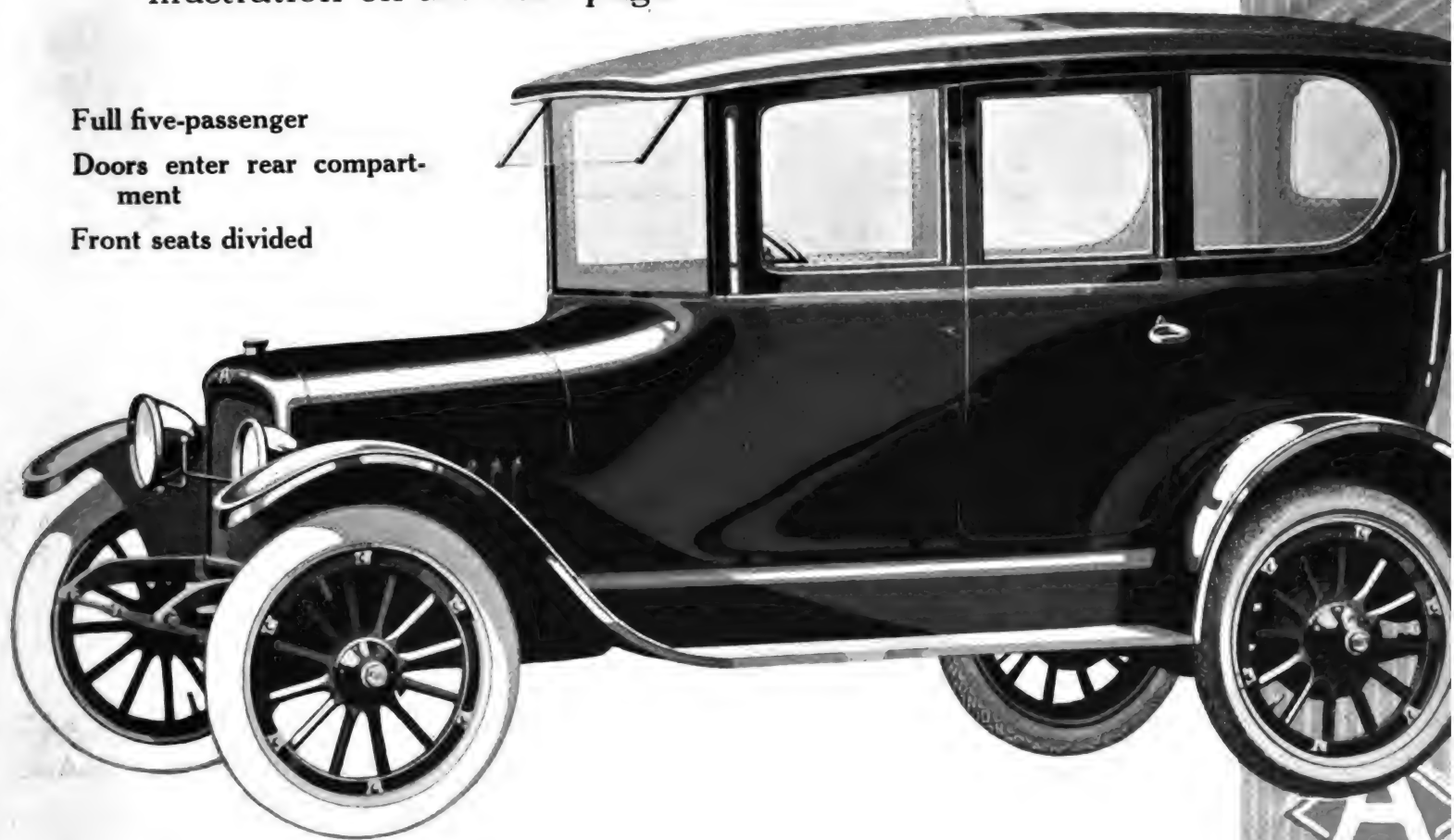
Both Coupe and Sedan satisfy the open car requirements for occasions when freedom of view and greater air circulation is desired.

In the Coupe all side windows lower out of sight. In the Sedan the side windows lower and upper door frame and pillars are quickly removable, making an open car as shown in the illustration on the next page.

Full five-passenger

Doors enter rear compartment

Front seats divided



Allen

Sedan

\$1095

Chassis Briefs

37 H.P. 4 cylinder 3 $\frac{3}{4}$ x5"
motor

Electric starting and lighting—
two unit system

112 inch wheelbase

55 inch rear springs

Full floating rear axle

Large easy-acting brakes

Stewart Warner vacuum feed—
gas-tank in rear

Tires 33x4", non skid rear

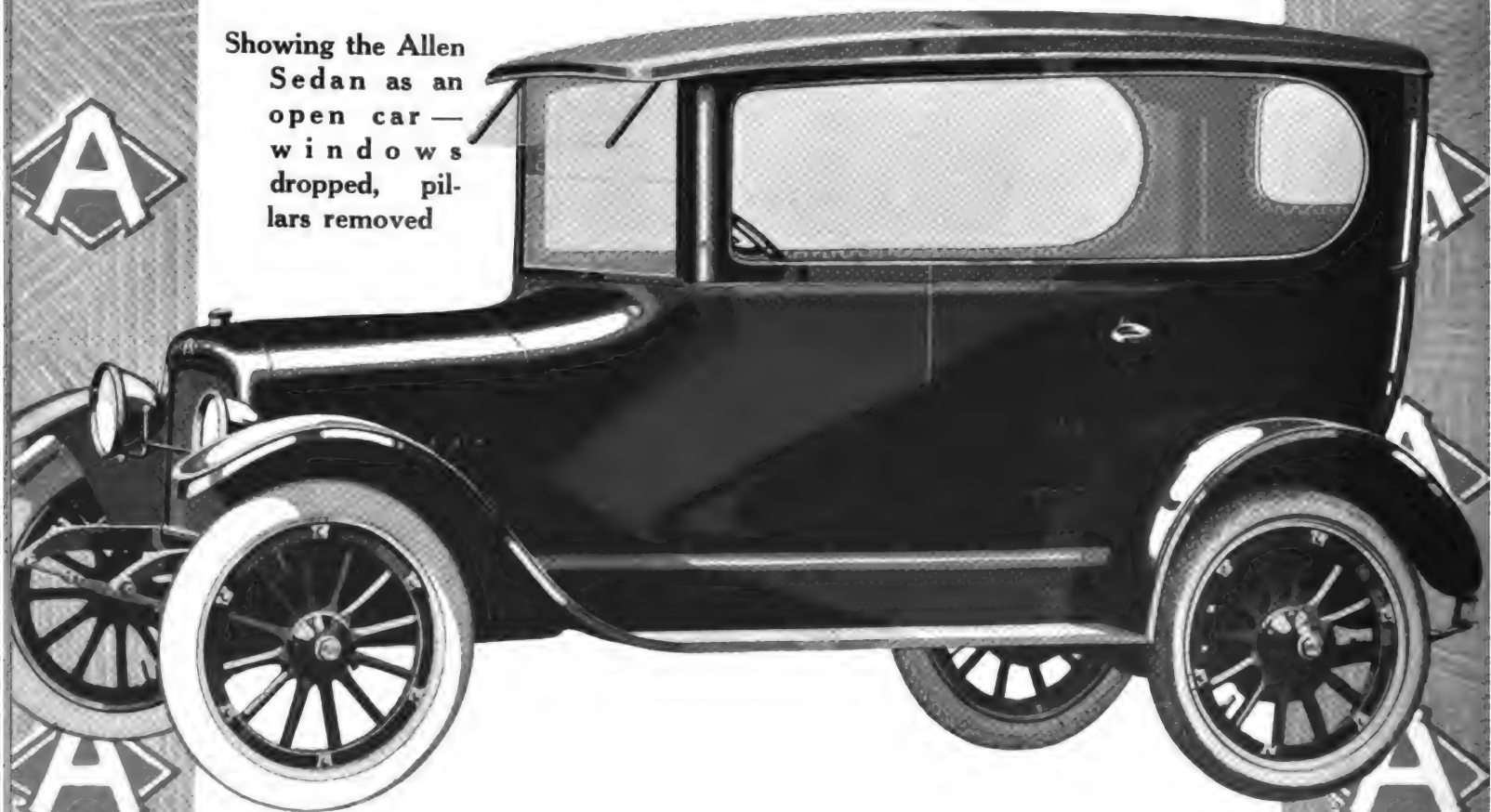
Write today for the Allen Dealer Proposition. Gain time and profit by applying at once if the Allen is not represented in your territory. The Allen is one of those big values—attractive to the car owner and as such a winner for the dealer. A liberal advertising campaign is behind it—also a factory that co-operates with the dealer from every department.

The Allen Motor Company

209 Allen Building

FOSTORIA, OHIO

Showing the Allen
Sedan as an
open car —
windows
dropped, pil-
lars removed





BRUNSWICK SKID-NOT TIRE.

The Brunswick skid-not tire, which will be placed on the market Oct. 1, 1916, is of the wrapped tread, single cure type, the tread being mortised. The middle of the tread, where is the greatest wear, will be smooth and contain the most of the tread stock. The depressions on the side have sharp, biting angles, for the purpose of preventing side slipping without resorting to suction and without loss of traction. The Brunswick tires will be made both in skid-not and plain tread for clincher quick detachable and straight side rims and will carry a 5000-mile guarantee. Distribution will be through the maker's branches to dealers direct.

Manufactured by the Brunswick-Balke-Collender Company, 623 South Wabash avenue, Chicago. List price, 34x4 Skid-Not, \$22.40.

PERFECTION PEDAL PADS.

Perfection pedal pads are molded from high grade, solid, pliable rubber, set in a cold rolled steel frame, which is attached to the pedal by metal prongs. The upper surface of the pad has deep, corrugated ribs, insuring a firm suction grip for the foot. The frame is nickel finished and is attached without the necessity of drilling holes in pedal or using bolts. A type for every make of car—when ordering give year, make and model of car.

Manufactured by the Auto Pedal Pad Company, 794 Seventh avenue, New York City. Prices supplied upon application.

SISSON'S WHEELITE.

Sisson's wheelite attaches to the left mud guard and illuminates the left front



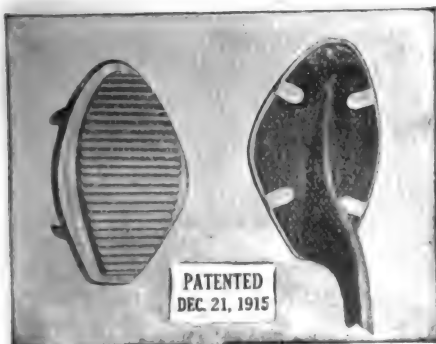
Brunswick Skid-Not Tire.

wheel so that its location is made known to the operator of an approaching car. The lamp is very small, but so arranged as to provide a flood of light on the wheel. It is protected from mud by its peculiar shape and a mud shield, so it cannot be clogged or dimmed in the worst going.

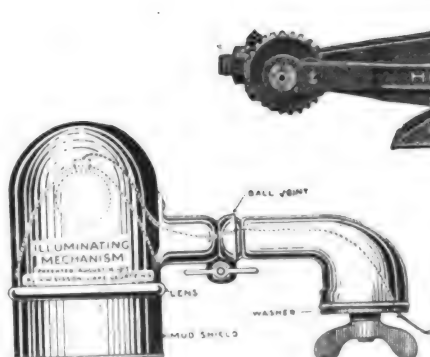
As a trouble light this lamp is very useful, as it can be swung on the ball joint, or quickly detached and a lead used to carry it to any part of the car. All sockets and connections are standard.

The maker advises the use of the device shown with small bolt attaching through the guard, as the contacting flange is well padded and will not mar the finish. A clamp bracket, also padded and adjustable to any style of guard, is optional with the purchaser.

Manufactured by H. W. Sisson, Lake George, N. Y. List price, \$5.



Perfection Pedal Pads.



Sisson Wheelite.

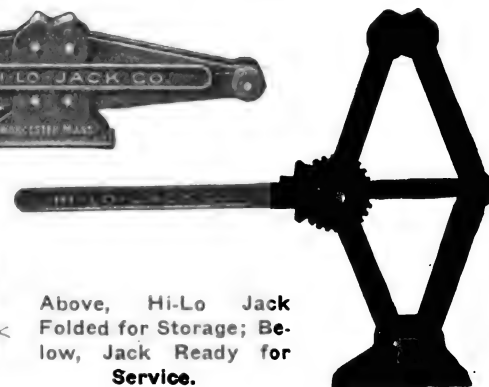
HI-LO-JACK.

The distinguishing feature of the Hi-Lo-Jack is the use of the toggle joint principle, which has long been known as the simplest method of applying power. It can be slipped under the lowest axle made and will start lifting at five inches and raise its load to 17 or 19 inches. The higher the lift the stronger it grows, the increase being at the rate of 2000 pounds to every inch of lift. Its remarkable power is due to the use of a horizontal screw, a special large sized ball thrust, which eliminates friction and assures easy operation, and because the handle is always central with the travel of the jack. The horizontal screw also prevents the jack releasing its load unexpectedly, this operation being wholly under control of the operator. The auto jack comes in sizes for cars weighing 2500 pounds or under and for cars of 3000 pounds or over. The small truck jack is for trucks from 1500 to 6000 pounds, and the large truck jack for vehicles up to 12,000 pounds.

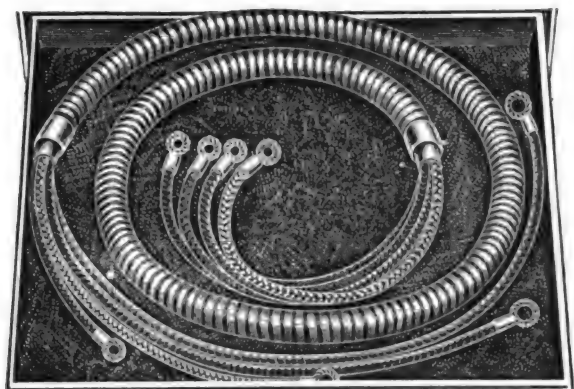
Manufactured by the Hi-Lo-Jack Company, 140 Green street, Worcester, Mass., and sold under a strong guarantee covering a period of one year. Write for prices.

FAW'S NEW IGNITION WIRING.

A valuable improvement has been made in the Faw ignition wiring assembly for Ford cars, a metal ferrule, which is not subject to deterioration nor effected by heat or oil, having been substituted for the former rubber end pieces on the flexible tubing. The metal ferrule is so arranged that when threaded on to the flexible metal tubing the ribs of the latter form a compressed thread, which clips the ferrules tightly in posi-



Above, Hi-Lo Jack Folded for Storage; Below, Jack Ready for Service.



Faw Ignition Wiring for Ford Cars.

tion and also prevents grease and oil from getting into primary wire tubing.

Another innovation is the use of a self-made soldered ring at both ends of the primary wires, the ring being formed of the wire conductor itself; the insulation is protected at the ends by polished brass ferrules and the entire wire and terminals forming one piece.

The Faw ignition wiring assembly is also made in five wires, one being to take care of the lighting circuit on the models of Ford cars provided with electric headlights.

Distributed by J. H. Faw, Inc., 41 Warren street, New York City. List price of the ignition assembly for four primary wires, 80 cents; the four secondary wires, 40 cents; the five-wire assembly, \$1.

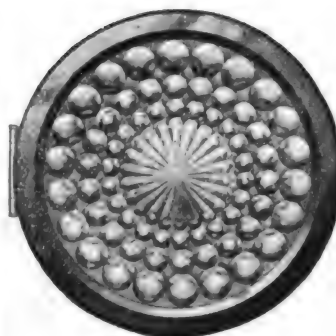
WARNER LENZ.

The Warner Lenz is a device for the prevention of the dangerous glare of headlights. It consists of a combination of 176 lenses in one, which breaks up the beam of light, clarifies it and distributes the resultant rays in a spray which covers almost 180 degrees. No dimmer is required with lenses to conform to legal requirements. With this device the whole road in front of the car is illuminated with a soft, but brilliant light for a distance of 300 to 500 feet ahead, yet it is possible to look directly into the light without being dazzled. To install, it is simply necessary to set the lenz in place of the plain glass in the ordinary lamp. Sold under a guarantee of money back if not satisfied.

Manufactured by the Warner Lenz Company, 914 South Michigan avenue, Chicago. List prices range from \$3.50 to \$5 per pair, according to size, in states east of the Rocky mountains.

FAN-FIRE SPARK PLUG.

A spark plug that gives off a flaming circle of sparks has been introduced under the name of the Fan-Fire, a name that is taken from the fact that it has a small nickel steel fan mounted loosely on a centre rod and rotating at a high rate of speed, throwing off hot sparks from each fan blade. The fan is actuated by explosions within combustion chamber and is claimed by its makers, as well as users, to deliver perfect ignition, thus increasing the power of the engine. Another advantage claimed is that because



Warner Lenz.

the fan is always rotating during operation of the motor it tends to keep itself clean by throwing off all carbon and oil deposits that would ordinarily accumulate on the metal and porcelain parts. The plug is fully guaranteed and strongly built of extra heavy porcelain and its bushings are air tight.

Manufactured by the Fan-Fire Spark Plug Company, Yonkers, N. Y. Price, \$1.

DEFLEX.

The Deflex is an adjustable headlight deflector, consisting of a pair of hinged lamp brackets, automatically operated by powerful, enclosed springs. From a lamp bracket a cable runs under the hood and up the steering column. Gentle pressure applied to a small lever at the end of the cable, instantly deflects the headlights, concentrating the full force of the light on the road just in front of the car. By touching a button the lights instantly spring back to their horizontal position. The device can be easily adjusted to any standard two post lamps already on the car and it is adapted to either a left or right hand drive.

Manufactured by the Universal Auto Parts Company, 1251 Michigan ave, Chicago, Ill. List price, complete, \$7.50.

PULL-U-OUT.

Pull-U-Out is a new mechanical device that has a dead weight lifting capacity of 3680 pounds and a hauling force that will move more than 100,000 pounds on wheels. With it one person, unaided, can pull a big automobile out of a ditch or hub-deep mud, or right the car if overturned. It consists of a substantial winding drum, a lever ratchet crank, a steel cable, a pul-



Fan-Fire Plug.

ley, two seven-foot chains and three 13-inch stakes, and it can be utilized to pull horizontally or lift a load of one ton with every 30 pounds of pressure applied to the crank of the winding drum. Our illustration shows the construction and application of the device, while the maker's descriptive literature explains it thoroughly.

Marketed by the Pull-U-Out Sales Company, 2018 Market street, St. Louis, Mo. Prices and catalogue sent upon application and mention of this magazine.

IDEAL DOUBLE TREAD TIRES.

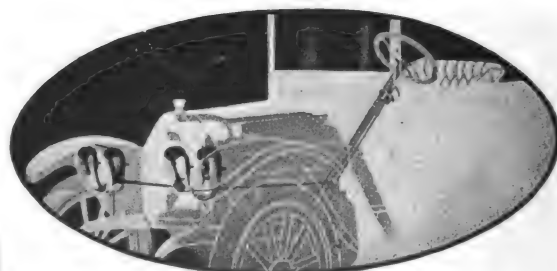
"A wonderful tire and a wonderful offer" is the phraseology used by the maker of Ideal double tread tires, which are sold under a comprehensive guarantee and adjusted on a 4000-mile basis. The assertion is also made that there is absolutely no danger of injury to inner tubes when these shoes are used, and that punctures and blow outs are almost impossible. The feature of the offer is the price list and that the tires will be sent C. O. D. subject to inspection when \$1, or a sum sufficient to defray express charges, is sent with the order. This offer is worth investigation.

Distributed by the Ideal Double Tread Company, 1604 Michigan avenue, Chicago. Shoes range in price from \$4.75 for 28x3 size to \$13.60 for 37x5½; new tubes from \$1.85 for 28x3 size to \$4.60 for 37x5½.

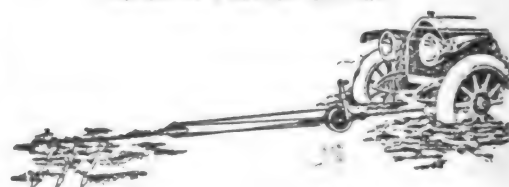
The Sterno cooking and camping combination outfit, is a very practical device especially designed for outdoor use. The large size consists of a can of Sterno canned-heat, a boiler of one quart capacity, a coffee-maker, windshield and a cover to be used as a frying pan or to form a double boiler.

Sterno canned heat is an inflammable paste resembling cold cream, which burns easily and can be extinguished and relighted until the entire contents of a can are consumed. It is smokeless, odorless, dangerless, non-explosive and non-spillable.

Manufactured by S. Sternau & Company, John and Gold streets, Brooklyn, N. Y. Descriptive circular supplied on request.



Deflex in Position on Car.



Pull-U-Out and How It Is Used.

GARLAND EXHAUST VENTILATOR.

The Garland exhaust ventilator is installed on the hood of the car directly over the point where the greatest volume of superheated air from the motor gathers to allow it to escape. The heat automatically escapes as fast as it is generated, the ventilator being capable of exhausting more than 25,000 cubic feet per hour with the car travelling at ordinary speed. The device operates even when the car is still, and may be regulated or entirely put out of action by means of a shutter control. It does not interfere with either the raising or lowering of the hood, and is storm proof. The operating principle is that air enters through the forward aperture, passing out through the lower vents and suctioning the heat from the motor with it. More than a thousand of these ventilators are now in service. The device is easily and quickly installed.

Marketed by the Ross-Wortham Company, McCormick building, Chicago. Write for details and price.

IMP GASOLINE BLOW TORCH.

The Imp gasoline blow torch, though small will do as much work as a larger one, and it will heat anything or solder anything any other torch will. It is for hand or bench work, has no pump or valve, is entirely automatic and burns two hours on one filling. It will produce a perfect Bunsen flame of more than 2000 degrees Fahrenheit, is perfectly safe in use and cannot get out of order. Its corrugated neck increases the heating surface and creates a greater pressure than could otherwise be obtained. The torch is all brass, nickel plated.

Marketed by the Carleton Company, 170 Summer street, Boston, Mass. Price, \$1.50.

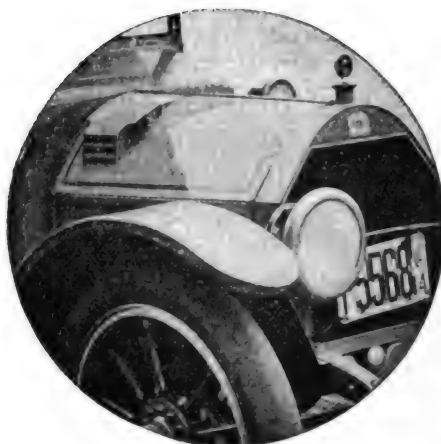
POSITIVE SPLIT RIM REMOVER.

The Positive split rim remover not only unlocks, contracts and removes split rims, but will also expand and relock them in position. It can be used on any make of split rim and can be adjusted to fit any size. It has arms that fasten to the rim at different points, one of which operates to "break" the rim lock, while the other arms contract the rim. The device is worked by a lever handle. The tool weighs but three pounds and is easily carried in the car.

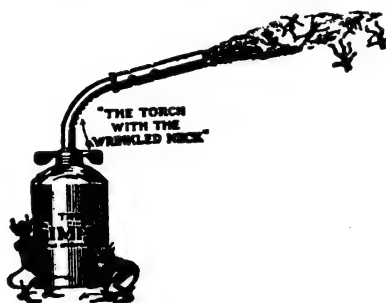
Manufactured by the Midland Supply Company, Davenport, Iowa. List price, \$2 and guaranteed under money back if not satisfied agreement.

SAVIDGE STEERING DEVICE.

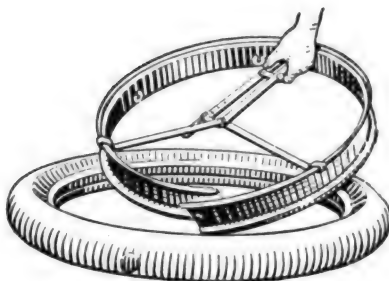
The Savidge steering device for Ford cars has been improved in its new form. The interior mechanism, which formerly was exposed to weather conditions, has been enclosed and the device now operates in an oil bath, thus reducing the possibility of wear. The purpose of the device is to keep the front wheels in a straight ahead direction, when not turned



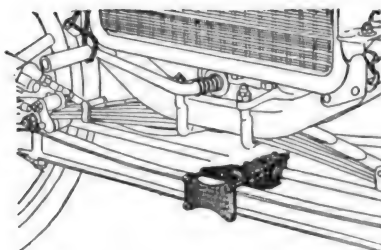
Garland Exhaust Ventilator.



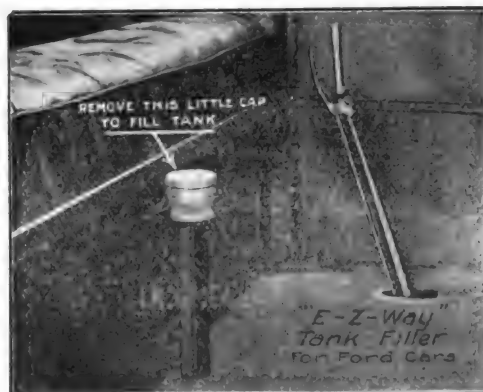
Imp Gasoline Blow Torch.



Positive Split Rim Remover.



Savidge Steering Device Installed.



Universal Tank Filler.

otherwise by the driver of the car. The maker claims that it prevents the wheels from wobbling, acts as a shock absorber on the steering column, makes steering easier, prevents the car from buckling under and provides positive control at all times.

Manufactured by the Savidge Company, Indianapolis, Ind. Price, \$4.90.

UNIVERSAL TANK FILLER.

The Universal tank filler is a combined filler spout and gasoline gauge and enables the owner of a Ford car to fill his fuel tank without getting out of the driver's seat. Our illustration shows the spout and gauge installed in the front compartment, close by the seat and entirely out of the way. The device is made of steel and aluminum and is guaranteed to last as long as the car. It is easily installed by any owner or garage man and complete instructions for the work are sent with each filler. It is not necessary to cut or drill a hole in the gas tank.

Manufactured by the Go Motor Speeder Company, Three Rivers, Mich. Price, filler only, \$3.75; filler and gauge combined, \$5.

GUARANTEED TUBES AND TIRES.

A branch of the tire business that is becoming an important factor is the sale of slightly used and demonstrating tires and tubes. The Tire Repair and Supply Company of Chicago, which specializes in that business, as well as in distributing fresh, selected stock of standard makes at bargain prices, is now holding its semi-annual sale. It guarantees all its tires to be free from imperfections in material and workmanship, and is sending them C. O. D. with the privilege of inspection to all those who deposit \$1 with each tire ordered, to prepay shipping charges. The sizes of new tires and tubes carried in stock range from 28x3 to 37x5, and among the slightly used and demonstrating tires and tubes from 30x3 to 37x5. To avoid delay in correspondence it is advisable to specify style of rim when ordering.

Distributed by the Tire Repair and Supply Company, Dept. B, 1463 Michigan avenue, Chicago. Prices of new tires range from \$6 to \$20, with 10 per cent. additional for non-skid; new tubes from \$1.25 to \$5.20. Prices of used tires, \$3.50 to \$9.75; used tubes, \$1.35 to \$2.20.

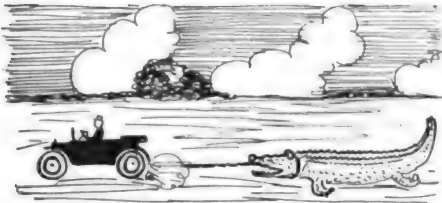
BAR CIRCLE TIRE.

The Bar Circle tire, a new Pennsylvania Rubber Company product, is designed for the popular trade. This new casing is of distinctive tread design. The tread is made of tough black rubber of high quality. The name is derived from a combination of heavy bars and circles. Each casing sold is accompanied by a 3500-mile guarantee.

Manufactured by the Pennsylvania Rubber Company, Jeannette, Penn. Prices and dealer proposition, including exclusive territorial arrangements, quoted upon request.

Graphic Items from the Fortnight's News.

Joe and Dan Davis of St. Petersburg, Fla., are probably the first fishermen to utilize a Ford car in place of rod and reel. They were fishing for alligators in

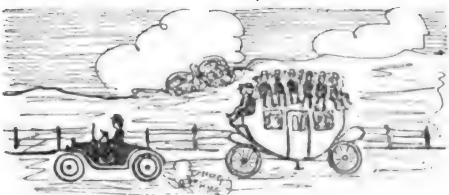


the river near St. Petersburg and after hooking a 10-foot saurian they attached the line onto their Ford and had no trouble in landing him on low speed. They later dragged him in trailer fashion to their home, where he was placed in a pen.

The farmers of Jackson county, Mo., must donate land for the rounding of road corners before any new roads will be built, according to a recent decision of the county court.

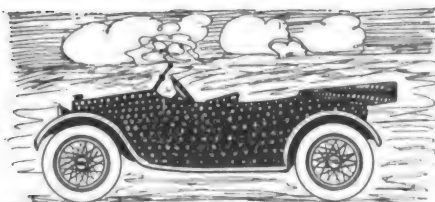
The State-Wide Good Roads Day Association has been formed in Pennsylvania to perpetuate good roads day in that state and to make it an annual event.

One of the queerest looking transport-



tation outfits in the country is in use by the workmen who are putting in a gas line in San Luis Obispo, Cal. It is made up of a Ford car and an old fashioned stage coach, the former being used as the tractor and the latter as the trailer. This odd looking combination, however, is very practical, as it transports 40 workmen at a time to and from their work.

Delving into psychological matters to obtain the proper finish for motor cars is a recent development. Arthur M. Maris of the Biddle Motor Car Company, says his company will turn out machines to satisfy the most fastidious tastes and to meet the foibles of artistic temperaments. Motorists who want machines to match or harmonize with their mood,

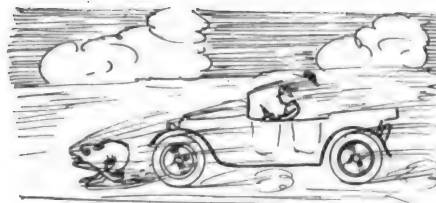


disposition or dress, may select them from the following colors: Suede, fawn, silver, sky blue, milky pink, turquoise and polka dot.

The Auto Manufacturers and Dealers' Association of St. Louis, Mo., has decided to hold the annual automobile exhibition in the spring of the coming year, instead of the fall, as has been the practice in past years.

F. W. Bliesecker of Somerset, Penn., has been elected president of the newly organized Somerset Automobile Association. The other officers are: G. J. Krebs, first vice president; D. L. Mille, second vice president, and C. W. Walker, secretary and treasurer.

Edward Spear of Spear Brothers, Dodge car dealers in Fresno, Cal., recent-

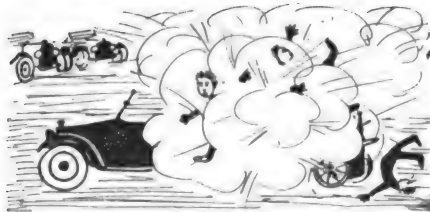


ly ran down a coyote after a chase lasting 28 minutes, during which both Spear and the coyote had some very narrow escapes. The coyote finally fell a victim to the right front wheel.

The Clintonville Automobile Club of Clintonville, Wis., was recently organized and has 115 members. Edward Felsow is president, John Kalmes vice president and W. M. Barnum secretary.

The Ohio license plates for 1917 will have a black lettering on a yellow background with the state name and year numbers reading vertically.

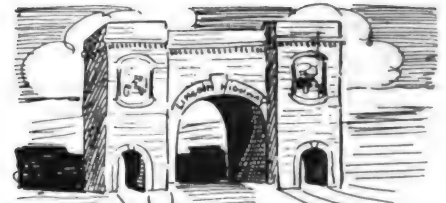
Looking down the gun barrel to see if it is loaded is tame sport alongside of the more modern diversion of lighting



matches to see if gasoline tanks are full or empty. In a Worcester, Mass., garage a short time ago a man who tried this means of finding out whether the tank was empty succeeded in burning up his car, exploding a 50-gallon tank of gasoline and getting into the hospital.

Columbus, O., motorists are rewarding the traffic policemen of that city with red and white sunshades to keep them cool. This has the effect of both warding off the sun and preserving at the same time a sunny temperament, which all traffic officers should develop as a salient characteristic.

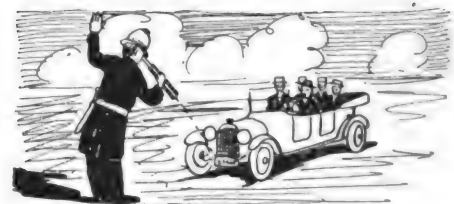
The erection of a Lincoln Highway arch at the city limits of Oakland, Cal., has been proposed and plans are already under way for carrying out the project.



Independence, Mo., has established a speed limit of five miles an hour in the business district and 20 miles in the residential section.

In Pennsylvania two road supervisors have been indicted by the grand jury for permitting the existence of poor road conditions in their jurisdiction.

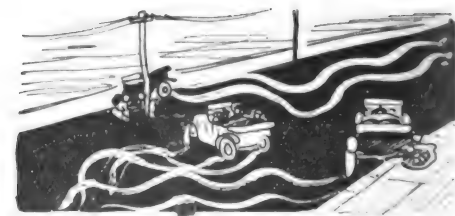
The police of New York City, after stopping several Connecticut motorists who had pasteboard license plates on their cars, learned from the authorities of the Nutmeg state that they were temporary substitutes issued because the freight embargo prevented delivery of a



consignment of metal plates for Connecticut.

Three thousand road signs have been placed within a radius of 65 miles of Omaha, Neb., by the automobile club of that city.

As the result of an overdose of road oil on Main street in Waterville, Me., there was a veritable skidding party before the authorities put out warnings to the motorists approaching the newly treated section. After one car had come to grief by skidding into the curb, breaking an axle, the rescue car which had been telephoned for slid into the scene at right angles, coming in contact with a



telegraph pole. Soon after another machine turned into the stretch with a tango motion, narrowly escaping collision with the first two cars.



LOCATING LOOSE BEARING.

(Figure 221 A.)

It is quite easy to feel for play in connecting rod bearings, when the crank case is open, by moving the rods up and down by hand. To feel for slack in main bearings is more difficult, because of the weight of the parts which have to be moved. In the case of the rear bearing, for instance, it is necessary to move the flywheel up and down, which is beyond the average man's strength. It may easily be done, however, by placing a jack under the wheel. It should be used with some discretion, simply applying enough lifting effort to take up any play in the bearing. This can be felt by placing the fingers of the left hand on the main journal, where it projects from rear bearing, and feeling for the slack while, with the right hand, the jack bar is given a slight up and down motion. Instead of a jack, a pinch bar, with fulcrum of suitable height, may be used for the same purpose.

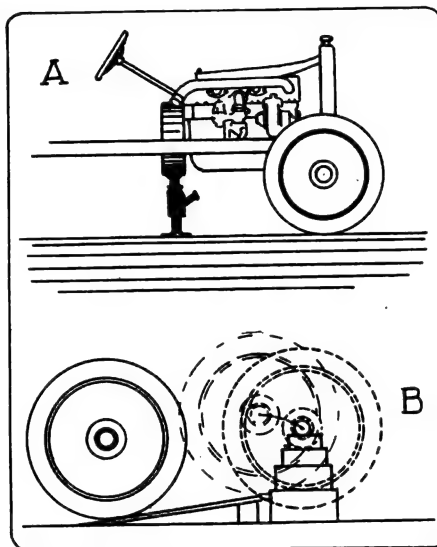


Fig. 221—(A) Locating Loose Bearings; (B) Jacking Without a Jack.

Instead of partially demolishing the nearest fence, in such circumstances, to get rails with which to "lever" up the axle, it is much more convenient to let the car raise itself, or, rather, the wheel requiring attention.

The "modus operandi" consists in raising one end of a short plank with a block of wood, a couple of bricks or any other "packing" material handy, thus forming an incline up which the wheel in question may be made to mount by driving the car in low gear. About a foot beyond the high end of the incline the packing blocks are placed, built up to a height of about two inches more than the normal clearance under the axle. On driving the car further ahead the axle drops down on this packing, leaving the wheel clear of the ground. To get the wheel back to "terra firma" it is easy to topple the packing over by pushing the car forward.

STUBBORN HUB CAPS.

(Figure 222.)

Two methods of starting a stubborn hub cap, as commonly practised in garages, are shown in the accompanying sketch. Figure A shows the hammer method, which is not to be recommended for all purposes, because of the possibility of bruising the wrench and injuring your hand, should the wrench slip. A better method is shown at B. If the cap be on a rear wheel the car's brake can be locked to obtain purchase, but should it be on the front a block can be forced against the tire to hold the car steady. A wrench is then placed on the cap and a jack placed to bear against the wrench handle. In this way great pressure can be brought against the cap. If the cap still sticks the only recourse is to heat it with a blow torch, taking care not to blister the paint. Kerosene should then be placed on the thread and the wrench applied before the cap has cooled and contracted to its normal condition.

JACKING WITHOUT A JACK.

(Figure 221 B.)

Occasionally it happens that a motorist has trouble on the road that necessitates the removal of a tire or demountable rim, only to find that his jack is out of order, or has been left in the garage.

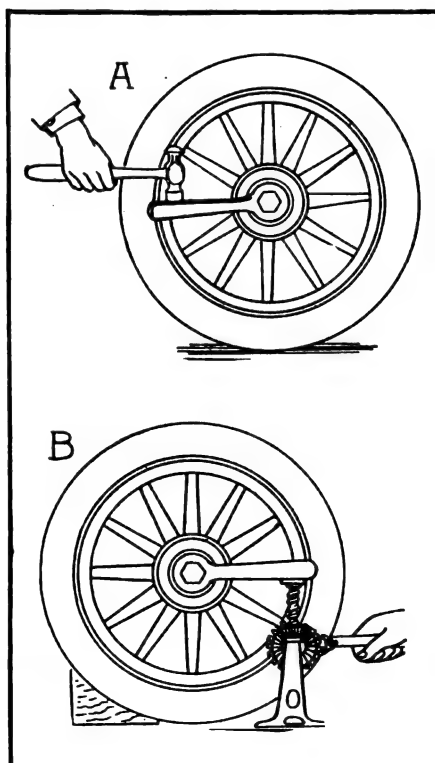


Fig. 222—Removing Stubborn Hub Caps.

FITTING NEW VALVES.

(Figure 223.)

When a new valve is fitted to an engine that has had considerable service it will often be found that, unless it is ground in, it does not hold compression as well as the old valve, although the latter may present a very uneven appearance. This has been puzzling to some motorists, who have assumed that as the new valve was ground to a true face in its manufacture it should make a perfect joint on the valve seat. This would be true if the seat retained its original angle and surface, but, after being ground a number of times, with the old valve used as a lapping tool, and being continuously hammered by the latter in months of operation, the seat may not only lose its original contour angle, but may have a pronounced "counter sink," especially if the old valve has been so often ground, or faced off in a lathe, that its diameter has been materially reduced, causing it to seat only on the inside edge of the valve opening. In such cases the new valve will rest on a surface which the old one did not touch, as shown in sketch, and this may be more or less covered with carbon, or otherwise rough.

The proper course, in such cases, is to tool the face of the valve seat with a regular valve seating tool, restoring it to the proper angle as well as a true surface, following this with a very light grinding in of the new valve. If a tool is

not available, considerable grinding will be necessary, using a coarse abrasive at first to bring the seat contour to approximately that of the valve, finishing up with a smoother compound.

SILENCING OVERHEAD VALVES.

(Figure 224.)

A practical and simple means of silencing noisy overhead valves is shown in the accompanying illustration. A small spring is fastened to the rocker arm and to any convenient part of the motor or chassis. It may be necessary to make an extension of a piece of wire so as to attach the lower end of the spring, as shown in the sketch. When the spring is properly placed it will overcome all noise that was caused by the valves.

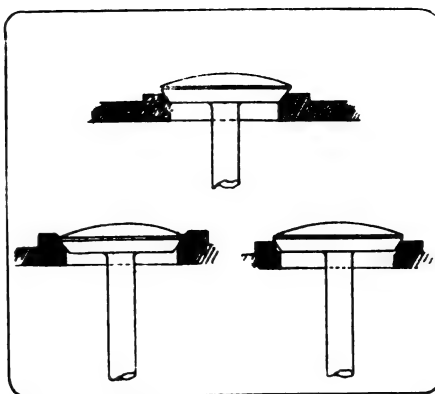


Fig. 223—Fitting New Valves.

EMERGENCY TUBE PRESS.

(Figure 225.)

Any motorist can improvise a tube press for roadside repairs if the following suggestions are heeded: After applying the patch to the tube place it between two blocks, measuring about 4x6x2 inches and mount an ordinary automobile jack upon the topmost block. Bind a strong piece of wire or cord around the blocks and over the head of the jack, as illustrated by the black line in sketch. By raising the jack the wire will be drawn tight and produce the pressure necessary for the repair.

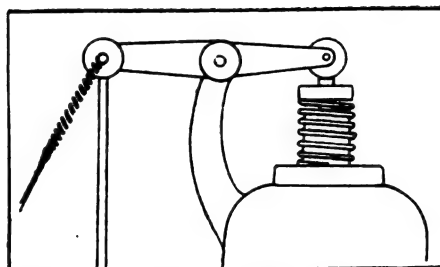


Fig. 224—Silencing Overhead Valves.

HOME-MADE SCREW DRIVER.

(Figure 226 A.)

For the removal of some of the larger sizes of machine screws the ordinary screw driver is often found inadequate, it being impossible to apply sufficient grip to its handle to turn the screw. While the turning effort may be increased by applying a small wrench, or pliers, to the blade, an offset screw driver is a much handier tool, combining the function of a lever with that of a screw driver.

Such a tool is also useful in dealing with screw heads in such close proximity to other parts as not to admit the length of the ordinary screw driver. One can easily be made from an old file, heating the end to a dull red and bending it at right angles to the length. The edge is then ground off to a thickness suitable for the size of screw for which it is to be used.

The shank end may be bent also and sharpened at the point, thus forming a convenient cotter pin puller, although it will be rather too soft to withstand very rough use.

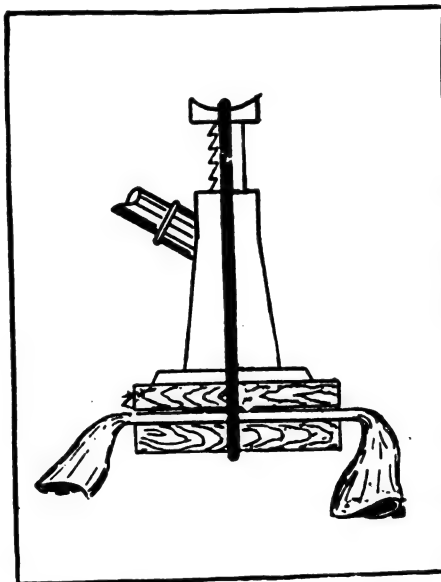


Fig. 225—Emergency Tube Press.

PROTECTING TIRES.

(Figure 226 B.)

Many owners fasten their spare tires to the side or back of the car with common skate straps. This practise is objectionable, for when they are held in this manner for any length of time the strap wears the rubber from the tire. A simple and practical remedy for this is illustrated in the sketch. Two slots should be cut in a piece of leather, measuring about four by six inches, and strap

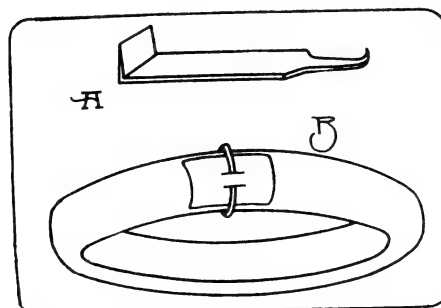


Fig. 226—(A) Home-Made Screw Driver; (B) Protecting Tires.

threaded through the slots as shown. When the strap is tightened the leather pad should rest on the tread of the tire.

CLEANING CHAMOIS SKINS.

Chamois skins quickly become dirty and coated with grease. They may be restored to a serviceable condition by first removing the caked matter with a stiff brush, then covering the skin with soft soap and allowing it to remain immersed for several hours in a bath of warm water to which a little washing soda has been added. Remove and rub the chamois well, after which wash it in a weak solution of soda, soft soap and water. Rinse well and hang up to dry.

CONVERTING TERMINALS.

Frequently the secondary cables leading to the spark plugs are equipped with closed ends. This necessitates the use of plugs which have the screw or nut type of terminal. If the clip type is used it is a good plan to cut a V slot in the closed end terminal of the secondary cables. This can be accomplished with a pair of cutting pliers. This arrangement does not prevent the terminal being used with the screw type of spark plug terminal.

RECTIFYING ENGINE OIL.

A well known lubricant expert states that when oil has been used in the engine for a considerable period it should be drained off and the crank case flushed with kerosene. It is possible to use this old oil again by placing the used lubricant in a transparent vessel and allowing it to stand in a warm place for about five or six weeks. It will then be found that the sediment has settled to the bottom of the receptacle. The upper or clear portion should be syphoned off and can be used again.

A cement for patching rubber boots and which will also unite leather to leather, India rubber, etc., consists of 15 parts rosin, 100 parts finely chopped India rubber and 10 parts shellac. Dissolve the ingredients in carbon disulphide. The vessel in which the preparation is made should be kept tightly sealed and should be shaken from time to time. Carbon disulphide is highly volatile and must not be exposed to a naked flame.

One often sees the assertion published that cast iron cannot be soldered, but the following plan has been adopted with success, providing that the repair is not to be subjected to excessive strains or heat. The part to be soldered is cleaned with a brass scratch brush and then the entire surface is covered with soldering acid. The next step is to sufficiently heat the metal so that it will melt and retain a thin coat of tallow. The part can then be soldered in the usual manner.

SUGGESTIONS FOR THE FORD CAR OWNER.

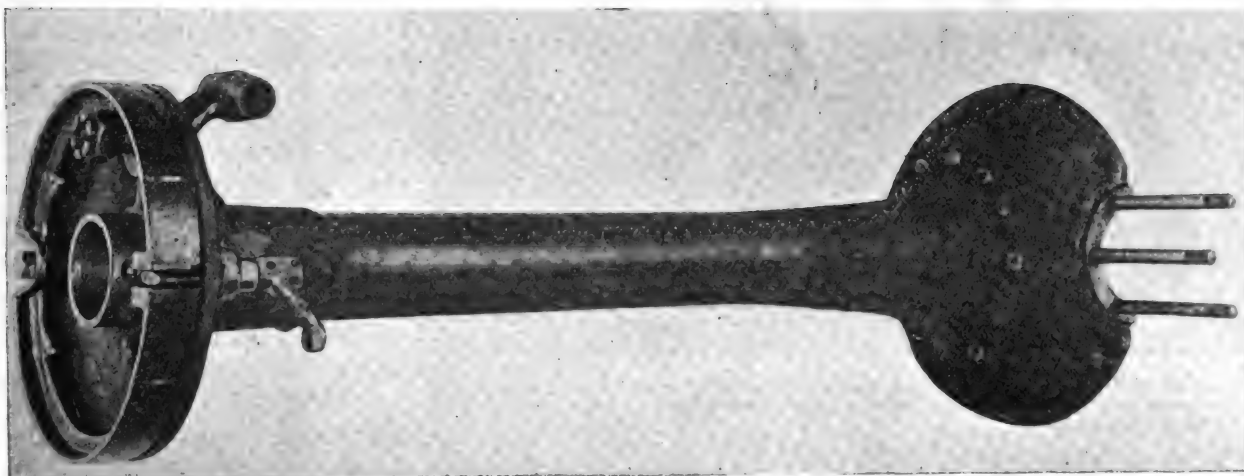
Wear of the Axle Shafts at the Outer Bearings—Construction of the Wheel or Emergency Brake and the Means of Adjusting the Shoes and Linkage.

The 55th article dealing with the operation, construction, maintenance, care and repair of the model T Ford chassis is the 16th of the series devoted to adjusting, restoration and overhauling.

EXAMINATION of the components of the axle after disassembling them, to determine the degree of wear and whether the parts will serve for a longer period, is important. The owner should remember that care should be taken in restoration work for the reason that a new part may not always be perfect fitting because of wear of the bore or bushing, and new parts are not made oversize to compensate for such wear. There may be instances where there is sufficient looseness when a new bolt or pin or rivet is fitted to justify use of larger sizes, or possibly the bores may be reamed slightly to take parts of greater diameter. In extreme cases bushings may be used to reduce the bores to the standard sizes of parts, which is the most efficient and cer-

the roller bearings. The rollers of the bearings are hardened steel, the hardness being obtained by heat treatment or tempering, and these rollers turn as the shaft revolves. The rollers are long and there is large bearing surface of the shaft against them, and when the bearing is well lubricated there should be comparatively little wear. The load of the vehicle is carried on the bearings and axle and unless there is good lubricity the rollers will eventually cut into the shafts, which are also heat treated steel, but decidedly softer, for they must have strength to resist the twisting strains and endure stresses that would fracture harder metal.

To illustrate, the shafts are steel drop forgings that are heat treated to meet the requirements for which they are designed, and these may be bent without breaking, but they will not resist the wear as well as the harder metal of the



Right Half of an Axle Housing with the Gearset and Shafts Withdrawn, but with the Spring Perch and the Brake Shoe Installed on the Brake Flange.

tain means of making restoration, and is really the most economical.

No satisfactory result can be obtained by replacing a worn part with new that does not compensate all play or lost motion. There is far greater economy in putting in all new parts where a satisfactory condition is not obtainable with a few, because the part variance will increase, the machine will be noisy, the wear will be rapid, and there is strong probability of inefficiency in a comparatively brief period. At the other hand, with complete restoration, the machine will be as efficient and as enduring as when new.

Greatest Wear in Axle Shafts.

The greatest degree of wear will probably be found in the axle shafts, where they contact with

rollers with which they contact. The roller bearings that carry the differential gearset of the axle are considerably larger than the bearings at the ends, the relative proportions being ample in the opinion of the designer to meet the conditions of reasonable service.

All conditions of lubrication being met, the inner or differential bearing ought to endure longer from the fact that it is larger and there is a greater surface in contact with the shaft. The stress upon this bearing is radial, that is, from the centre of the shaft outward. The teeth of the driving pinion and the master gear mesh at an angle of 45 degrees, and as the driving shaft turned the effect of the movement is to turn the master gear and there is a tendency of the pinion and the gear to separate.

This results in what is known as side or radial pressure, which is taken by the roller bearings, and there is also end pressure or thrust, that is taken by the thrust rings between the hubs of the differential gears and the axle housing. In heavier and more costly axles other types of bearings are used, these being designed to endure both forms of load, and these may be either annular, ball or roller bearings, and they are some times made adjustable to compensate for wear. The radial load is dependent upon the load carried by the vehicle and the speed, while the thrust load is in ratio to the speed, the load and the direction in which the machine is driven.

Thrust Upon the Differential Gearset.

The differential cage that carries the master gear is assembled with three bolts, and in this the spider, on which are three pinions, is between the two differential gears. The bolts maintain the exact relation of the pinions and gears. There is comparatively little movement of either pin-

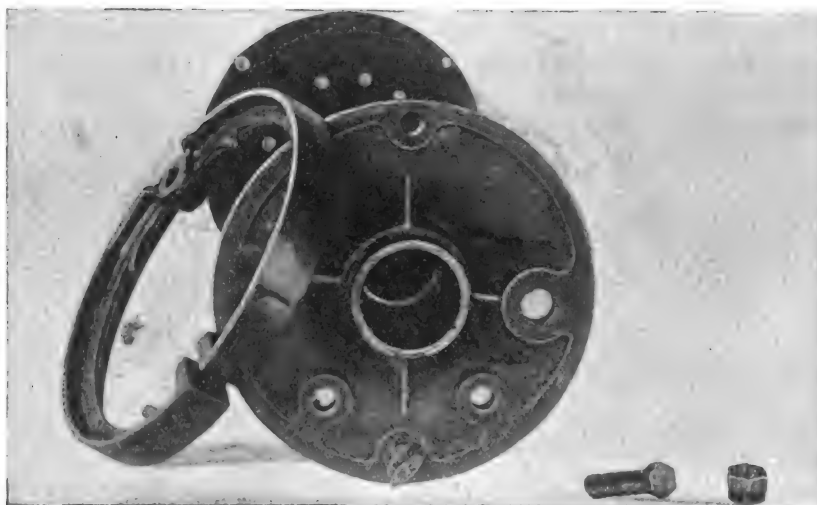
pressure from shock of the wheels contacting with road obstructions, which is extremely variable and cannot be gauged with certainty or accuracy. The end thrust upon the driving axles from the wheels is at times considerable, dependent upon the load, the character of turns, the speed and the angularity of road surface or crown. This is taken by the thrust rings and may be increase or reduction of the constant thrust of the differential from the driving pinion and master gear. The wear of the roller bearings into the driving shafts is a result that may be expected, but it will be in ratio to the degree of lubrication.

How the Assembly Is Lubricated.

The entire assembly in the central section of the axle housing is lubricated by filling the housing with grease—preferably graphited—which should be of a consistency that will work into the differential cage and reach the spider, pinions and gears; be carried by the master gear to the driving pinion, and will be distributed to the differential roller bearings, the thrust rings and the roller and thrust bearings of the driving shaft. Good lubrication cannot be obtained unless the housing is well filled, for the gearset and master gear must revolve in the grease, and if the lubricant is so heavy that channels will be cut in it and it will not flow or consolidate, there will be very poor lubricity. By filling the housing and keeping it filled with a good quality grease, there will be comparatively little wear of the gearset and bearings.

The lubricant from the housing will not work through the

roller bearings outward in sufficient volume to lubricate the end bearings, and these are lubricated by grease cups that are installed in the flange castings. The grease cups are not large and for that reason should be filled frequently and screwed down so that there will be sufficient volume of the contents distributed. The work that these bearings must endure may be judged from the fact that the wheels must revolve 672 times for each mile driven, 67,200 for 100 miles, 672,000 for 1000 miles and 6,720,000 for 10,000 miles, and all the time carrying varying load. As the bearings wear into the shafts the areas contacting with the shafts are lessened because of the decreased diameters and the upper rollers only eventually rest upon the shafts and support the load. Only when the axle is jacked and relieved of the load, so the shafts will rest on the lowest parts of the bearings, can the degree of wear be determined. With good lubrication the



End of Axle Housing, Showing the Sleeve of the Outer Bearing in the Tube, with the Brake Shoe and Anchor Stud Removed and the Camshaft Exposed.

ions or gears so long as there is traction with both wheels, but when one wheel does not have adherence there is differential action proportionate to the engine speed.

The end thrust at the differential is dependent upon the direction of vehicle movement, but as the machine can only be backed slowly, the thrust pressure from reverse is relatively small. The thrust is taken by the bronze rings or large washers that are free to move between the two fixed rings or washers between the differential cage and the axle housing at either side. The bronze rings are grooved on the surfaces to distribute the lubricant.

The roller bearings that are at the outer ends of the housing are smaller than the differential bearings, both in length and diameter, and while there is no end thrust upon them, there is radial or side pressure in ratio to the weight of the chassis and its load. There is also the added

shafts will wear slowly, but constant attention is necessary, else there will be too much lubricant forced into the bearing, which will result in exudation on the brake flanges and then onto the brake shoes, causing slippage of the shoes in the drums and brake inefficiency that may be extremely dangerous.

The Detail of the Brake Flange.

Referring to the accompanying illustration of the right half of an axle housing (right side as installed) one will note the semi-circular opening of the central section and the three studs that carry the housing for the driving shaft bearing, and the series of rivets that secure the flanged tube to the casting. The brake flange at the left end of the housing is a casting that is riveted to the tube, and this is drilled in five places. Three of the holes are 90 degrees apart on centres in the upper half of the flange. The hole near the top of the flange is for the spring perch, in which is fitted the spindle of the perch, and which is secured by a castellated nut. This nut is securely tightened to insure against turning and is retained by a heavy cotter pin. The hole in the forward side of the flange is to carry the camshaft that actuates the brake, the shaft extending through the flange and being sufficient length to fit the bore of the hub of the brake lever.

The camshafts are $3\frac{1}{8}$ inches length and $\frac{1}{2}$ inch diameter, and the cams are a "double-toe" type, so as to exert pressure in either direction from the shafts. The holes in the brake flanges that carry the shafts are fitted with bushings having $\frac{1}{2}$ inch bores and $11/16$ inch external diameter. The ends of the camshafts are drilled with two holes and the hubs of the brake levers are similarly drilled, and the hubs are secured on the shafts by two pins that are peened after being fitted. Unless the brake camshaft bushings are worn, which can be easily determined, there is no need of disassembling them, but after filing the peened ends of the pins in the lever hubs they can be driven out and the camshafts loosened by tapping them with a drift and light hammer. The bushings can be driven out of the flange and replaced, but if there is much play after the bushings have been renewed the most satisfactory result can be obtained with new camshafts. New camshaft lever pins may be necessary as well.

Braking System Is Simple.

The brake shoes have been described previously, but statement should be made that they are carried on what is known as anchor studs or bolts at the rear of the flange and are so hung that as the cams are turned in the slots between the ends the shoes are slightly expanded, contacting with the brake drums. The brake shoes may be bronze, but they are generally iron castings that are turned true on the faces and ought to contact practically the full circumference when

expanded. The cast iron and the steel of the pressed brake drums wear comparatively slow, and there may not be need of renewal, but the brake shoes and drums should be thoroughly cleaned. There is an illustration that shows the brake shoe removed from the anchor stud beside the axle flange. The brake flange shows the two holes on either side of the camshaft that take the ends of the fork of the radius rod, which are secured by nuts.

The braking system of the Ford chassis consists of the brake incorporated with transmission gearset and the brake on the rear wheels. The transmission gearset brake is a contracting band type of good proportions and is normally used as the service or running brake and operated by a foot pedal, and the wheel brake is an expanding shoe type that is known as the emergency brake and is operated by a hand lever. The brakes are not large, but are ample for all service requirements provided that they are maintained so that they will have the efficiency intended by the designer.

The service brake band is spring steel and nearly encircles the drum of the brake disc or spider of the transmission gearset. At either end is riveted a lug or ear that is slotted to take the brake shaft. On the shaft is a helical spring that is between and keeps separate the ears of the band so that there will be sufficient clearance between it and the brake drum. On the shaft, outside the ears, are cams so located that when the shaft is rocked by pushing the pedal the spring is compressed, the ears forced closer together and the band contacted with the drum in ratio to the pressure upon the pedal. The entire service brake system was described and illustrated in previous installments.

(To Be Continued.)

COAL GAS POSSIBILITIES.

The possibilities of coal gas being used as a temporary substitute for gasoline in motor cars has been revived by European trade journals, but the prospects of its adoption are very slight, owing to the prohibitive weight of the gas cylinders that would have to be carried and the enormous amount of capital required to build the producing plants.

DENVER PLANS SPEEDWAY.

The Colorado Springs Athletic Club of Colorado is planning the building of a \$1,000,000 speedway for automobiles, to be ready for use next summer. Spencer Penrose and Charles MacNeil and several other wealthy men who were instrumental in building the highway up Pikes Peak are interested in the promotion of the speedway.

INDUSTRIAL NEWS AND NOTES.

Haynes Co. May Change Hands—Big Concerns Announce Adoption of New Names.

The Haynes Automobile Company of Indiana may be sold to the Haynes Automobile Company of New York, the latter corporation being formed of a number of New York financiers. The deal has not been consummated as yet, the new concern having 90 days in which to complete the purchase.

On Aug. 23 the stockholders of the Haynes company of Indiana ratified an agreement with a representative of the New York syndicate by which they are to receive \$4,500,000 and half of the stock of the holding company. Six shares of the holding company's stock will be given for one share of the old stock and the holding company retains 600,000 shares of stock, the remainder to be offered for subscription on the market. The old stockholders also reserve the right to elect half the members of the board of directors.

It is understood that A. G. Sieberling, who has been manager of the company for several years, will continue in that capacity, as will also his assistants. It is also reported that a cheaper car than the present model will be added to the line, to be known as the Junior Haynes.

PENNSYLVANIA RUBBER COMPANY.

The Pennsylvania Rubber Company of New York, with a capital of \$6,000,000, was formerly the Pennsylvania Rubber Company of Jeannette, Penn. The new company was incorporated by H. W. Dupuy and S. G. Lewis of Jeannette, and G. A. McLoughlin of New York City.

The old concern was capitalized for \$2,000,000, of which amount \$1,750,000 is outstanding.

REPUBLIC REORGANIZATION.

The entire business and assets of the Republic Motor Truck Company, Inc., of Alma, Mich., have been taken over by the Republic Motor Truck Company, Inc., which has been chartered under the laws of New York, with an authorized capital of \$1,000,000 seven per cent. cumulative preferred stock and 62,500 shares of common stock of no par value.

The \$750,000 par value preferred stock that has been issued was purchased by Messrs. George H. Burr & Co., bankers.

TAKES OVER PARTS PLANTS.

Benjamin Briscoe, president of the Briscoe Motor Corporation, has announced that all plants making parts that enter into the manufacture of the Briscoe car have been taken over by the parent organization and that the Briscoe car is now being built complete in the factory at Jackson, Mich. Motors, frames, transmissions, forgings, axles,

fenders, tops, steering gears and all other parts, with the exception of accessories, are manufactured from the raw material.

The new policy was announced, together with the fact of S. H. Humphrey's election as vice president, in charge of manufacturing. Mr. Humphrey is one of the best known quantity producers in the business, and was formerly a vice president of the Chalmers Motor Company of Detroit.

PARKER RIM CORPORATION.

The Parker Collapsible Rim Corporation has filed a charter at Dover, Del., under which they will manufacture and deal in rims and other parts of all kinds of vehicles. The capitalization is \$5,000,000.

AMS TO BUILD AUTOS.

Charles M. Ams, president of the Sterling Auto Manufacturing Company, Paterson, N. J., has announced that the concern's business will be removed to Amston, Conn., formerly Turnerville, which was purchased by Mr. Ams several years ago. A new plant is being erected at Amston, where automobiles will be manufactured. It is understood the company will put a roadster, five-passenger car and a light delivery wagon on the market this fall.

SCOTT HOSE CLAMP.

The Bartlett Manufacturing Company, 40 East Lafayette avenue, Detroit, Mich., has purchased the Scott patents and all assets and good will in connection with the Scott hose clamp and will manufacture and market that product.

SPRINGFIELD BODY COMPANY.

The Springfield Body Company of Springfield, Mass., has experienced an increase of 1000 per cent. in orders for their product during the past 12 months.

The concern is now furnishing bodies as standard equipment to the following automobile companies: Abbott-Detroit, Cadillac, Cole, Davis, Haynes, Inter-State, Marmon, Mitchell, Oldsmobile, Overland, Paige-Detroit, H-A-L, Reo, Stearns, Studebaker, Velle, Westcott and Winton.

THE TORBENSEN AXLE COMPANY.

The Torbensen Gear and Axle Company of Cleveland, O., has changed the name of the corporation to The Torbensen Axle Company. The new plant, located on a site of four acres on East

152nd street, Cleveland, is rapidly nearing completion and modern machinery is being installed, greatly increasing the productive capacity of the company.

Four buildings comprise the new plant. Two are machine shops, one having 12,000 square feet of floor space and the other 10,000 square feet, and two are warehouses, each having 4000 square feet. Plans have been made for the erection in the near future of another machine shop with manufacturing space of 15,000 square feet.

ARBENZ CAR REVIVED.

The Arbenz Motor Car Company of Chillicothe, O., incorporated under the laws of that state, with a capital of \$1,000,000, will resume the manufacture of the Arbenz car, which has not been on the market for several years. The new concern has taken over the old Arbenz Car Company. M. F. McFadden, E. C. Spoder, M. C. Hayes, W. J. Purcell and R. I. Pillars are the incorporators.

ADDITION TO PEERLESS PLANT.

A large addition is being planned for the Peerless Motor and Truck Company of Cleveland, O., to provide ample room and facilities for a greatly increased production which has been made necessary by the large foreign orders recently received by the company for trucks.

United Motors Shows Prospects for Future.

Interesting Summary of Conditions and Growth of Industry Given in Prospectus.

The United Motors Corporation has issued a 64-page prospectus which gives an interesting summary of conditions and the growth in the automobile industry in their relation to the concern's business.

The prospectus describes each of the five units comprising the United Motors Corporation and is well illustrated. Speaking of the outlook the prospectus says:

"Orders already placed assure the equipment of the million and a half cars that are to be built in 1917 with at least one of the parts made by these united companies. A great majority of these cars will have three or four of these products and many will have all of them.

"Couple with these figures the ever increasing demand for many million anti-friction bearings in tractors, motor trucks, farm implements of all kinds, automatic machinery, mine cars, electric motors, line shafting and various other commercial applications, besides the demand for ignition systems for motor boats, gasoline engines and tractors, and the demand for these products may be realized.

"In order that the automobile may run there must be a power to crank the engine, sparks to fire the cylinders and light for it to make its way in the dark. There must be anti-friction bearings wherever there is a turning part. In fact, the motor car, as we know it today, would be impractical were it not for anti-friction bearings and for those other devices which make it easy and convenient of operation."

MASTER CALORITE PLUGS.

The contract for furnishing the United States postal service for the coming year with spark plugs has been awarded to the Hartford Machine Screw Company, manufacturers of Master Calorite spark plugs.

This is looked upon by the makers as a very strong testimonial to the quality and durability of their product, which they have been constantly improving whenever possible. The sales of Master Calorite plugs have been constantly increasing during the past season and are continually growing in favor with motor car users who exact strenuous service from their machines.

MURRAY EIGHT ANNOUNCED.

The Murray Eight, manufactured by the Murray Motors Corporation of Pittsburgh, Penn., has been thoroughly tested and is now on exhibition for dealers and agents.

Ford Garner a Million a Week.

Financial Report Shows Total Net Profits for the Past Year of Nearly \$60,000,000.

The Ford Motor Company, Detroit, Mich., made over \$1,000,000 a week during the fiscal year ending July 31. The total profits were \$59,994,118, and the year's gross business was \$206,867,347. Cash on hand and in banks on July 31 totaled \$52,530,771, as compared with available cash amounting to \$6,400,100 at the end of the fiscal year in 1912.

There are now 49,870 men employed by the company and of this number 36,626 receive \$5 a day or more in wages.

JORDAN INCREASES OUTPUT.

The Jordan Motor Car Company of Cleveland, O., in its new plant is turning out five cars a day and it is expected that this rate of production will be doubled within a month.

DANIEL'S PRICE \$2800.

The price of all models of the Daniels car, manufactured by the Daniels Motor Car Company of Reading, Penn., has been advanced \$200, the price now being \$2800.

U. S. LIGHTING & HEATING CO.

Company Reports \$1,300,000 in Unfilled Orders on Hand---Board of Directors Chosen.

At the annual meeting of the stockholders of the U. S. Light and Heating Company of Niagara Falls, N. Y., Edwin K. Gordon of the H. E. Lisan Company of New York City, was elected to the board of directors. Mr. Gordon's election was in the form of recognition for the efficient and successful handling of the concern's advertising and publicity campaign during the past year.

The other directors elected were: Egbert H. Gold, Chicago; J. Allan Smith, Niagara Falls; A. H. Ackerman, Niagara Falls; Chauncey L. Lane, Niagara Falls; Ralph C. Caples, Baltimore; Henry W. Farnum, Chicago; James A. Roberts, New York City; Conrad Hubert, New York City; George G. Shepard, Niagara Falls; Keene H. Addington, Chicago.

The company has unfilled orders on hand amounting to \$1,300,000, the largest figure reached in the history of the concern. A contract was recently made with the Willys-Overland Company for a large number of lighting equipment units for the new model Overlands. Only about 75 per cent. of this order, however, was accepted, as it was so large the company's facilities were not sufficient to turn it out on contract time.

HERSCHELL-SPILLMAN.

A large addition is being made to the plant of the Herschell-Spillman Company, manufacturers of the motor of that name at Tonawanda, N. Y. The building is of concrete construction and is equipped throughout with safety and labor saving devices. Guy R. White, vice president and general manager of the company, says: "Up to the present time we have found it almost impossible to take care of the demand for our motors, especially the eight-cylinder V type, which we have had to treble our production on."

BODY FACTORY IN FRAMINGHAM.

The Bela Body Company of Amesbury, Mass., will occupy the factory at Framingham, Mass., formerly used by the Standard Woven Fabric Company, which has been moved to Walpole. There is about 40,000 square feet of floor space in the factory, which is of cement construction, three stories in height, 53 feet wide by 224 feet in length.

LAYMAN-LOWY MOTOR CAR CO.

The Layman-Lowy Motor Car Company has been incorporated under the laws of New York with a capital of \$5000. It is reported that they will manufacture a novel design of motor car to sell at \$3000, this price being for the chassis alone.

M. C. Mayer, Winthrop S. Horton and

George B. Rubenstein are the incorporators. Leo L. Lowy, Emil Lowy and Ralph E. Layman incidentally incorporated the Lowy Patent Corporation to hold the patents for the various new construction designs that are being introduced into the new car, which will not be shown to the public until the New York show, next January.

Two features of the car are a new type axle and a transmission made up of only five parts, which the inventor claims will entirely eliminate the possibility of clashing gears.

LOZIER RESIGNS PRESIDENCY.

H. A. Lozier has resigned as president of the company which bore his name, the H. A. Lozier Company of Cleveland, O., manufacturers of the H-A-L Twelve. He has been succeeded by A. Ward Foote of the Foote-Burt Company, machine tool makers.

CHEVROLET PROMOTIONS.

H. Milton Richardson, who has been assistant manager of the Detroit factory branch of the Chevrolet Motor Company for over two years, has become branch manager, succeeding C. E. Dawson, who has become connected with the main factory as zone supervisor.

MURPHY OUT OF CHALMERS CO.

Gall Murphy has resigned as advertising manager of the Chalmers Motor Car Company of Detroit, Mich.

WILLIS SUCCEEDS EMERSON.

R. S. Willis has been appointed purchasing agent for the U. S. Rubber Company to succeed C. A. Emerson, who has resigned after a period of nearly 30 years in active service with the corporation.

I-HEAD EIGHT IN JACKSON.

The 1917 eight-cylinder Jackson cars, manufactured by the Jackson Automobile Company of Jackson, Mich., will have I-head motors. They will be marketed with four styles of bodies and will be equipped with the Stewart vacuum system, a Zenith carburetor, Auto-Lite starting and lighting and Remy ignition systems. The chassis has a wheelbase of 118 inches and the wheels are equipped with 34x4 tires. The two-passenger roadster sells for \$1295; touring car, \$1295; four-passenger roadster, \$1395; seven-passenger touring car, \$1870.

DODGE LEAVES HOUK COMPANY.

L. G. Dodge, general sales manager of the Houk Manufacturing Company of Buffalo, N. Y., has resigned.

AUTO SHOW SEASON UNDERWAY.

Middle West Exhibitors Report Very Successful Shows—Danbury Announces Date.

The automobile show at the Danbury (Conn.) fair, Oct. 2-7, has grown to be one of great importance to manufacturers, dealers and buyers. It is reputed that more sales are made at the fair than at any other show held in the eastern states in the fall. Practically three-quarters of the exhibition space in the large automobile building is engaged ahead from year to year.

This fall there has been such a demand for space that tent annexes will be erected for the overflow. In one of these commercial cars will be displayed, while in another the tire and accessory makers and distributors will exhibit and demonstrate their wares.

The automobile display is continued the entire week of the fair, the exhibits remaining intact until the last afternoon. For space and full information address G. M. Rundle, secretary, Danbury, Conn.

MILWAUKEE SHOW.

The second annual automobile show held under the auspices of the Milwaukee (Wis.) Automobile Dealers' Association was a big success. There were 40 dealers exhibiting and 85 different makes of cars were displayed in Machinery hall at the State Fair Park.

INDIANAPOLIS SHOW.

The fall automobile show at Indianapolis, which was held in a big tent at the Indiana state fair grounds, was the largest ever held under the auspices of the Indianapolis Automobile Trade Association. The products of over 70 different factories were shown by the 50 odd exhibitors that participated in the exhibition.

COLUMBUS SHOW.

Thirty-eight pleasure cars and a large number of trucks were put on exhibition at the fall automobile show held in South Machinery hall at the Ohio state fair grounds, Columbus. The exhibition was in force during the week of the fair and was under the auspices of the Columbus Automobile Show Company.

The pleasure cars shown included the following: Willys-Knight, Westcott, Vellie, Studebaker, Saxon, Roamer, Reo, Pierce-Arrow, Pathfinder, Paterson, Packard, Owen-Magnetic, Overland, Oakland, Milburn Electric, Metz, Marmon, Maxwell, Madison, Briscoe, Buick, Chalmers, Chevrolet, Cole, Dorris, Dort, Detroit Electric,

Elcar, Elgin, Empire, Franklin, Haynes, Hudson, Jeffery, KisselKar, Liberty.

TROY, N. Y., AUTO SHOW.

The Troy automobile show, held under the auspices of the Troy, N. Y., Automobile Dealers' Association, is scheduled for the week of Oct. 7th to 14th.

PROGRESSIVE DAYTON.

The Greater Dayton Association of Dayton, O., through its good roads committee, has started a state-wide movement to have every municipality place signs at the corporate limits on the main highways, giving the name of the town, something about its best features, as well as road information.

PAVING DEMONSTRATION.

A demonstration of paving brick construction will be given at Paris, Ill., next month, in connection with the annual meeting and conference of the National Paving Brick Manufacturers' Association to be held Oct. 5-6. The annual business meeting will be held at the Deming hotel in Terra Haute, Ind., on the first day of the session and the members will go by train the next day to

Paris, where the economy of construction details in building a brick pavement by laying the brick in green mortar will be shown.

Anyone who expects to attend can secure hotel accommodations by notifying Will P. Blair, secretary, Cleveland, O.

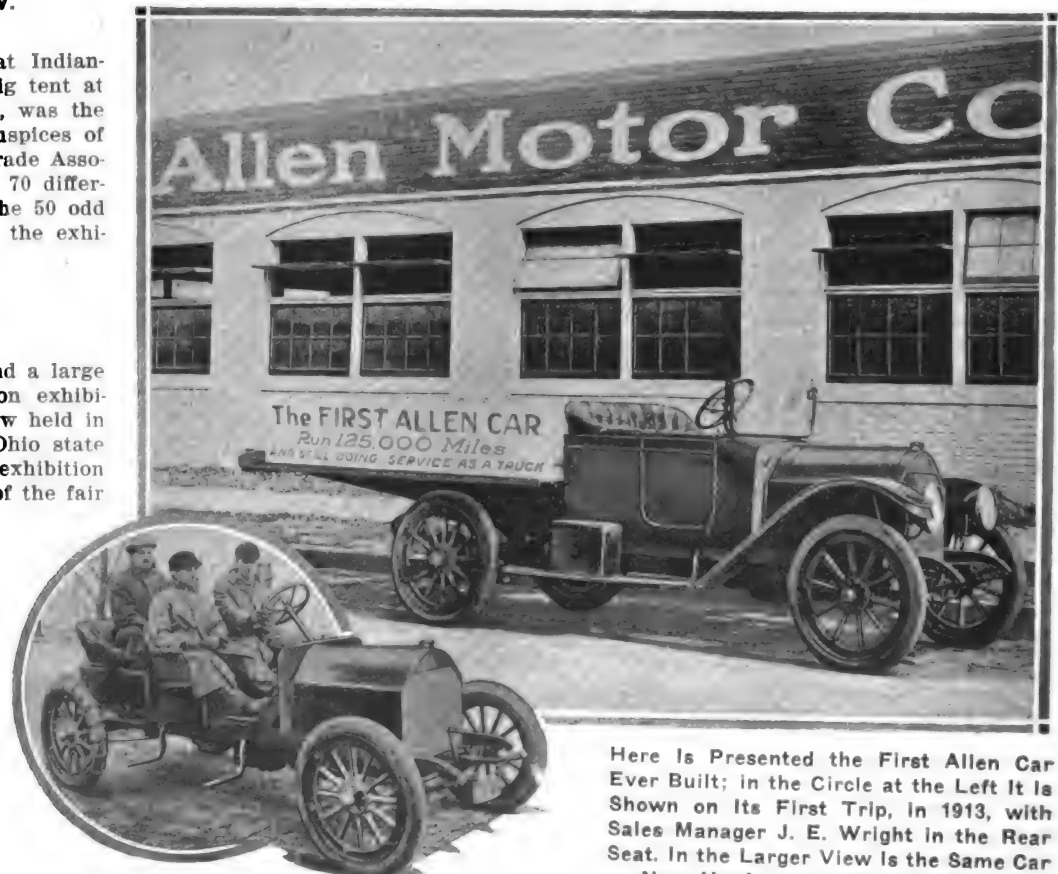
HEAD LIGHT CASE IN BOSTON.

A Massachusetts man was accused of not complying with the new headlight law of that state, but was found not guilty. The defendant was driving a Locomobile which was not equipped with any special lenses. On the testimony of Delmar Roos, the lighting expert of the Locomobile Company in Boston, the court decided that the concentrated glare was kept less than three feet and six inches above the ground by the adjustment of the light and focussing. A test was made prior to one of the hearings and the police were satisfied that the Locomobile lights were in compliance with the law.

PATHFINDERS IN RUSSIA.

The Pathfinder Company, Indianapolis, Ind., has shipped a train load of 47 Pathfinder 12-cylinder cars to Petrograd, Russia, where they will go to the regular trade, none being ordered for war purposes. The shipment included both touring cars and clover leaf roadsters.

The members of the Automobile Club of Toledo, O., have gained the good graces of the traffic officers of that city by presenting each with a wooden platform and canvas sunshade.

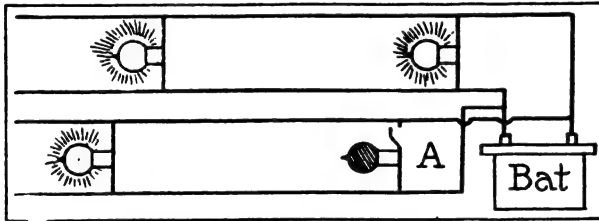


Here is Presented the First Allen Car Ever Built; in the Circle at the Left it is Shown on its First Trip, in 1913, with Sales Manager J. E. Wright in the Rear Seat. In the Larger View is the Same Car Now Used at the Allen Factories.

MOTOR STARTING AND CAR LIGHTING.

The Influence of Temperature Upon Battery Capacity and Why Efficiency Is Reduced by Cold—The Benefits from Outside Charging and Careful Flushing.

BECAUSE there are no means of determining battery capacity with any degree of accuracy, save by tests that are practical only in the



Break in Multiple Wiring That Will Only Extinguish One Lamp of the Circuit.

thoroughly equipped station and by expert battery men, the ammeter and the voltmeter are depended upon very largely by manufacturers of lighting and starting systems to indicate generally operating efficiency, and the owners and drivers are advised to adhere rigidly to a formula of attention that will maintain the systems reasonably satisfactory.

One condition obtaining, that is probably the result of enthusiastic salesmanship quite as much as anything else, and which leads to neglect or carelessness, is the fact that each buyer is impressed with statements that the system is so designed that practically no attention is necessary. This is all wrong, for the buyer is led to assume that the equipment is both indestructible and fool proof, while he should be advised that unless it is used and maintained just as it was designed to be used and maintained it will not afford anything like its possible or practical utility.

The initial cost of the system is necessarily minimized and this means that the components are as a rule not of such proportions that they will endure when neglected or abused. By this is meant that the generator has sufficient capacity to supply current for the lights and charge the battery; the motor is large enough to start the engine in such conditions as may be reasonably anticipated, and the battery will be adequate

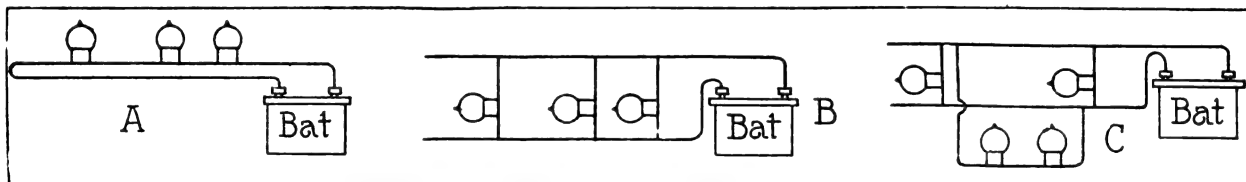
sought by the manufacturers, and wherever practical improvement has been made and insurance provided so far as possible against abuses and negligence. But the lead-acid battery, which is the type universally used, cannot be built so that it will afford anything like the service normally obtainable unless it is used exactly as it should be operated. Reference has been previously made to the fact that a battery should be charged and discharged at a definite rate to conserve battery life, but extremely heavy demands are made in starting the engine, which is diametrically opposed to part of this rule.

The work for which the battery is intended, however, requires this excessive amperage drain, and the nearest approach to the rule is to use the motor for the briefest possible time when starting the engine. The engine ought to start readily enough, and should there be failure to fire the starting switch should be released and the condition of the ignition system or the carburetor ascertained. The cause can be learned and the necessary restoration made. If the engine is driven by the motor for any period after firing is begun the battery is being unnecessarily exhausted. The cost of the current is not a factor for consideration, but the continuous efficiency of the battery is very important.

Charging Continuously Must Follow.

Charging the battery continuously is another condition that conflicts with the rule previously referred to, and because of the construction there is a flow of current practically all of the time, for the machine will be driven but little when the generator is not productive up to its capacity. The lights will consume all of the current when they are used, but if the machine is driven largely by day light and the engine is started only when necessary and allowed to idle when short stops are made, the efficiency of the battery will be all that can reasonably be expected.

This, however, relates to charging and dis-



Different Systems of Lamp Installation: A, Lamps Wired in Series; B, Lamps Wired in Multiple; C, Two Lamps in Multiple and Two in Series in the Same Circuit.

for the work if it is kept to the standard of efficiency it should be.

Simplification, as has been stated, has been

charging only. The electrolyte of the cells must be kept to the height advised by the battery manufacturer. There is very slight diminution of

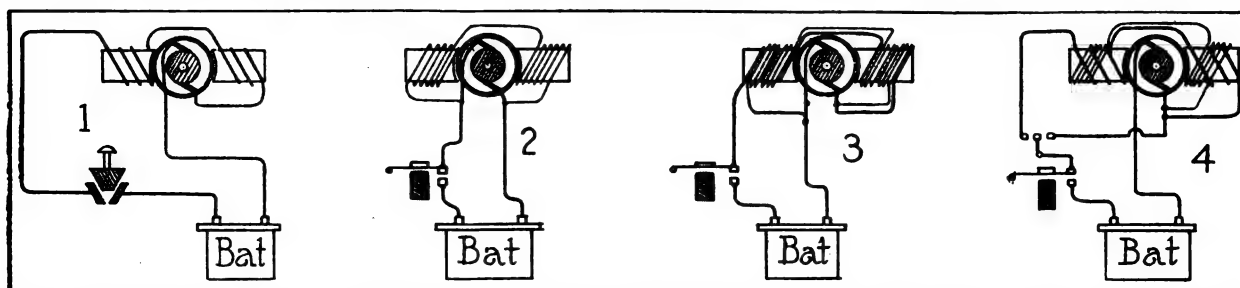
the acid, but the water is freely dissipated and the exposure of the plates not only is destructive, but materially lessens the plate area, and plate area is the real factor in battery efficiency. The battery makers have taken care of the other problems so well that there should be but little concern regarding them, but the maintenance of electrolyte is vital and is imperative.

The Influence of Temperature.

Emphasis should be made of the loss of cell efficiency from various causes such as local action, accidental short circuits, leaky jars, diminished specific gravity of electrolyte, accumulations of sediment, and sulphation (due to charging irregularity), to say nothing of the influence of temperature. One of the causes of battery inefficiency that is little realized is change in temperature. Unless otherwise stated all battery ratings are established with the electrolyte at 60 degrees. The highest temperature that is permissible is 110 degrees Fahrenheit. What is probably the most satisfactory temperature for operating is 85 degrees. The effect of the rise or fall of temperature is pronounced, the density of the electrolyte, upon which depends the battery

electrolyte that has a specific gravity of 1.277 at 40 degrees will have the same acid volume (38.37 per cent.) as an electrolyte of 39.75 at 80 degrees. Thus the rise of 40 degrees is equivalent to a decrease in acid volume of 1.38 per cent. Still another illustration is that the specific gravity of an electrolyte containing 42.62 per cent. acid will be the same (1.291) at 110 degrees Fahrenheit as an electrolyte containing 39.63 per cent. acid at 40 degrees, and yet the actual difference in acid of the two electrolytes is three per cent. of the total volume.

One will logically ask the reason for the variance in activity, for there is seemingly basis for belief that the greater the volume of acid the more active would be the action upon the plates. The best answer is the variance in the porosity of the plates, which contract with the decrease and expand with the increase of temperature. The effect of charging the battery in an unchanging temperature is to reduce the sulphate of lead that covers the surfaces of the plates to peroxide of lead for the positive plates and sponge lead for the negative plates, which causes the plates to contract because of the conversion of the sul-



Different Forms of Field Windings: 1, Series, with Starting Switch in Circuit; 2, Shunt Winding with Cut-Out in Circuit; 3, Compound Winding, with Cut-Out in Circuit; 4, Differential Winding, or "Bucking Coil" with Regulator That Controls the Coil and Cut-Out in Circuit.

efficiency, decreasing with the rise and increasing with the fall in a ratio that can be very closely followed.

Taking sulphuric acid with a specific gravity of 1.835, which is the commercially pure standard (1.842 is the chemically pure standard), an electrolyte that will contain a volume of 42.62 per cent. by volume, will show a specific gravity of 1.291 at 110 degrees and will increase to 1.315 at 30 degrees, or three points rise for every fall of 10 degrees of temperature. Assuming that 60 degrees of temperature is the standard and a density of approximately 1.277 is shown at 80 degrees. An electrolyte having this specific gravity will contain 39.75 per cent. 1.835 sulphuric acid by volume. When the temperature of the electrolyte has fallen to 40 degrees the specific gravity will be 1.289, which is the reading that an acid volume of 41.25 would show at 80 degrees. Thus the fall in temperature is equivalent to an increase in acid volume of 1.50 per cent.

Changes in Specific Gravity.

Or the result may be put in another way. An

phate of lead into acid that unites with the water of the electrolyte and increases the specific gravity. Discharging the battery will cause the formation of sulphate of lead on the surfaces of the plates, and as the sulphate of lead is larger in volume than the peroxide of lead from which it is converted, and the sulphate is deposited in the pores of the plates until the pores are filled, and then on the surfaces, the positive plates are expanded considerably.

Greater Chemical Activity.

The negative plates contract and expand but slightly as compared with the positive plates and for that reason are not so greatly influenced by the changes in charging and discharging. If the plates are contracted because of low temperature the porosity is reduced correspondingly and there is less sulphate deposited in the pores and a greater volume deposited on the surface. There is more chemical activity with the increase of temperature and tendency to sulphation is more pronounced.

Summarizing the result of low temperature

we find the porosity of the plates is reduced, the volume of acid is less, and the chemical activity is slower, and the tendency to sulphate is retarded. These conditions are reversed as the temperature is increased, provided there is the same rate of charge and discharge, and are not permanent. That is, a battery taken from a garage that is at a temperature of 60 degrees will gradually lose capacity as the temperature falls and will gain to normal standard of efficiency when brought back. The battery temperature can be maintained by charging it, even at a very slow rate, but reduction of the current stored or accumulated will make it more susceptible to cold.

Little Probability of Freezing.

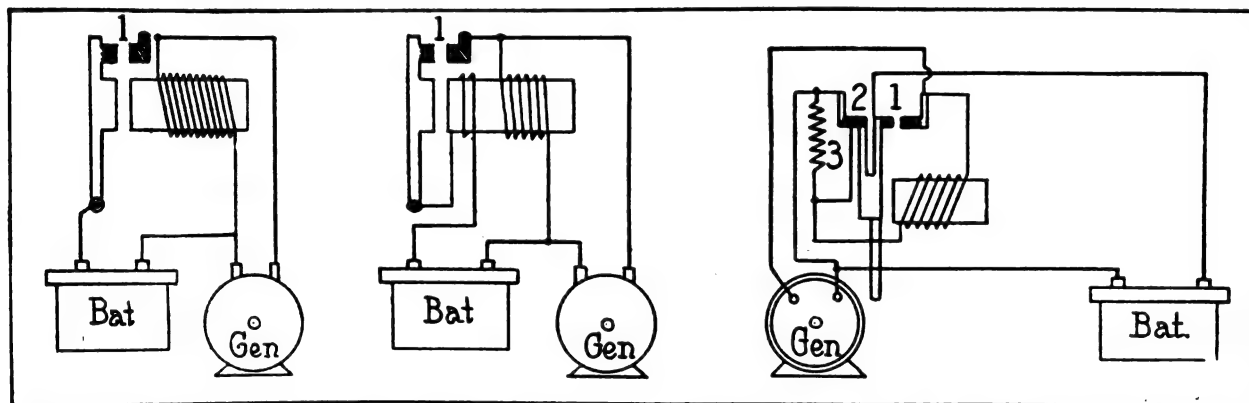
There is little probability of electrolyte freezing, however, unless the battery is left completely discharged and in a very cold place. A battery having a specific gravity of 1.160 will freeze at approximately five degrees Fahrenheit above zero, and at five degrees below zero an electrolyte of 1.175 will congeal, and from that point the resistance to freezing is very pronounced, a 1.200

should be means of securely holding the batteries in the boxes so that they cannot do damage by the movement of the vehicle.

Need of Hydrometer Readings.

Emphasis has already been made of the necessity of equalizing the batteries and this had best be done by filling to the height required with distilled water at least once a week, but from time to time the condition of the electrolyte should be determined by hydrometer readings. This cannot be well done by the owner because of the lack of experience, but can be done by battery men of charging stations, and as this is really necessary the owner should insist upon a record, and these records may be used from time to time to determine the actual conditions as resulting from service.

A very safe practise is to remove the battery from the car at intervals of once a month, even if seemingly efficient, and having it charged slowly and for a period of not less than 12 hours, which will reduce the sulphation, and then a test of the electrolyte will show very accurately what may



Diagrams Illustrating Electromagnetic Cut-Outs: At Left, Simplest Type of Shunt-Connected Coil; at Centre, Magnet Wound with a Compound Coil; at Right, Double-Contact Type of Regulation, the Current Flowing Normally Through the Shunt Magnet Coil, Closing the Cut-Out Contacts and Opening the Other, Sending the Magnet Current Through Resistance. In These Diagrams 1 Represents Contacts, 2 the Second Contact and 3 the Resistance Coil, the Last Two Designations Being in the Double-Contact Diagram Only.

electrolyte being safe to 16 degrees below, a 1.225 electrolyte to 36 degrees below, a 1.250 electrolyte to 60 degrees below, a 1.275 electrolyte to 80 degrees below and a 1.300 electrolyte to 100 degrees below.

Because of the very evident reduction of battery capacity from reduced temperature all batteries ought to be protected so far as possible, which will insure a better efficiency during cold weather. Battery boxes ought to be metal, lined with wood or some other equally good non-conductor of heat, containing wood grids as seats for the jars. Such wood as is used for lining the boxes ought to be saturated with paraffin, and given several coats of asphaltum paint, and there should be means for draining the boxes so there can be no accumulation of electrolyte in them, and so that the wood may from time to time be washed with a saturated solution of sodium bicarbonate, which will neutralize the acid and prevent it actively attacking the wood. There

be necessary to afford what may be regarded as full restoration. No owner is qualified to make repairs to a battery—first, because he lacks the equipment to do the work well, and, secondly, because he lacks experience. Just as careful workmanship is required for repairing a three-cell battery as for one having many times that number, and there is no reason to believe that experiments are practical.

(To Be Continued.)

MOTORS IN SHANGHAI.

During 1915 the number of motor cars, trucks and motorcycles licensed in Shanghai, China, increased by 118. The total number of licenses issued was 539, as compared with 443 in 1914 and 64 in 1906. There were 217 cars imported in 1914 and of these 46 were shipped to other ports in China. Shortage in ocean freight facilities has decreased the importation.

favorable case of the dry mixture.

Advantages of Dry Mixtures.

Dry mixtures have so many advantages and so few disadvantages as to warrant the belief that it is along these lines that effort can be concentrated with prospects not only for immediate success, but for success of a kind that will be followed by widespread general adoption of dry mixture apparatus. Such mixtures can be supplied to any number of cylinders through a straight header pipe with right angled branches, and each cylinder will receive exactly the same charge as every other, regardless of load, speed or throttle, and without any special bulky manifold construction. In burning, the combustion is complete and perfect, assuming, of course, that a good carburetor is used to control the proportions of air to oil and keep the ratio constant. Smoke and carbon deposits are eliminated and so also is cylinder weeping. Such mixtures are hot, necessarily as hot as the fuel vapor pressure requires and therefore the compression must be reduced, reducing horsepower and efficiency correspondingly but not to a serious degree. As everything depends on the temperature required, it is necessary to investigate this through the properties of the fuel and those of the mixture of vapor and fuel in combining proportions.

Fuel properties and mixture properties that are of importance to this question are (a) the composition of the fuel as indicated by the fractional distillation and ultimate analysis; (b) the vapor pressure temperature curve of the fuel and of its several fractions and constituents; (c) the density of the constituent vapors and the mean density. Besides these properties a relation is required between the partial and total weights of constituents of the mixture and their corresponding pressures, as a tie or bond between proportions and dryness temperature for any one fuel.

(The author here discusses the thermodynamic laws which affect the relations of vapor mixtures, of variable densities and physical properties, and air, at various pressures and temperatures, pointing out the difficulty of deriving any fixed rules, or data, applicable to the problem of carburetor design, owing to the composite character of commercial hydro-carbon fuels, which are composed of several substances whose physical characteristics, such as vapor tension, temperature of evaporation at different pressures, etc., are widely different. It is pointed out that empirical data, based on experimental determination of the "dryness" temperatures of various mixtures in combination with air in variable proportions, should form the basis on which development should proceed. Attention is called to the necessity of producing intimate mixture of fuel vapor with the air, and to the bad effects of partial or complete segregation of the fuel particles in the vaporizing device, since this increases the vapor pressure at that point, with consequent rise in "dryness" temperature, which may reach a point at which decomposition takes

place, resulting in deposits of tar and carbon in the heating chamber. Prof. Lucke continues as follows:)

One of the most important lessons to be learned from the analysis, therefore, is the basic and fundamental importance of most thorough and vigorous mixing of all the air with all the oil at the time of and during vaporization in order to secure the dryness condition at the least possible temperature. In this way, not only will the dangers of tar and carbon deposits be removed even with heavier distillates than kerosene, but also the dry mixtures will be the coolest, and the dryness temperature excess be the least, and the latter possibly zero. Cool mixtures are most desirable, but only when warm enough to be dry or substantially so, because they permit of maximum compression consistent with properly clean combustion. Their production by properly designed heated vaporizers requires the minimum of heat the lower the temperature, and size of heater is important in automobile work.

Cases have been observed in which, due to bad design of such vaporizers, mixtures above 500 degrees Fahrenheit have not been dried, while with good design and the same kerosene fuel, perfect dryness was secured at 250 degrees Fahrenheit, half as much, and with a vast difference from the operating standpoint as well as from that of design. Not only is the latter entirely feasible without pre-ignitions with reasonable compressions, but it is easily obtainable from the exhaust heat even when idling, whereas the former is not, and the size of the vaporizer in terms of the surface required to transmit the quantity of heat needed with the mean temperature difference available, is much less than half in the latter case, because not only is the heat required about half, but the mean temperature difference is more than twice the former value.

Classification of Heated Vaporizers.

In form and arrangement heated vaporizers are divisible into classes based on the sort of passage provided for the mixture during its heating and vaporizing period. Into the first class fall all those passages that are more or less equivalent to a helical coil. Among these are the Brouhot, Fig. 3 (Sorel), and Martha, Fig. 4 (Sidersky), old French alcohol arrangements, and the Thornycroft, Fig. 5 (Clerk and Burls), a more recent English kerosene equipment. The second class is characterized by crooked, free passages, somewhat equivalent to coils, but of irregular rather than regular form, illustrated by Crossley, Fig. 10, and Fielding and Platt, Fig. 6 (Clark and Burls), English kerosene oil engine vaporizers intended for stationary use and with hit-and-miss regulation.

Passages arranged to deflect the stream so as to separate out heavy liquid drops, and deposit the separated liquid into more or less isolated pockets in which vaporization takes place while the main stream passes by, are typical of the third class. The class is illustrated by the Petreano, Fig. 7 (Guldner), an old Italian form of multiple pockets, the Durr,

Fig. 8 (Sidersky), and Koerting, Fig. 9 (Guldner), both German alcohol forms, the latter being of single liquid pocket type. The fourth class includes all those forms of simple free passages that tend to force the wall film formed by the heavy liquid drops along the heated walls without depositing in pockets. This class is illustrated by the Campbell, Fig. 11 (Clark and Burls), an English, and by the Capitaine, Fig. 12 (Clerk and Burls), a Belgian oil engine. In the former an elbow, and in the latter the contracting walls of a straight conical passage serve to promote the formation of the wall film, and flow velocity tends to drive it along the hot surface where it is vaporized.

The several examples of each class differ somewhat in details one from another. In the first class, for example, the exhaust passes through a central pipe in the Martha, but in the Thornycroft it is outside, while in the Brouhot it first passes through the centre and then returns by way of a counter helix. The last two stand vertically and the mixture flows upward as it vaporizes by its passage through the helix, while the former lies horizontally and its helix is perforated so that part of the mixture can pass directly through. In all three the primary object of the helix is to secure large heating surface for the mixture in a small space. The Thornycroft supplements this by longitudinally radial ribs extending into the exhaust passages, as exhaust heat is relied upon for operation. Both examples of the second class form part of the engine head. Exhaust heat is used in the Fielding and Platt, but is supplemented by internal heat of combustion; part of the combustion chamber wall is also a part of the vaporizer wall. The Crossley relies directly on the heat of a blow torch. In both cases the passages are tortuous to fit available space and to give extended heating surface in a compact casting.

The separator pocket (third class) forms are heated by a simple external exhaust jacket in the Koerting and Durr, and by a central tube in the Petreano, the two pocket walls constituting inward extensions of the heating surface. Mixture flow in the last is alternately down toward the centre and up toward the outside, the sharp angle pockets lying next the central exhaust wall, where the liquid can lie and distil, practically excluded from the air stream, which takes the shortest path across the top, as indicated by the arrow. That flooding is expected is indicated by a bottom chamber below the outlet and by a drain cock provided. Mixture descends in the Durr through a large, long and straight central pipe and heavy liquid is deposited in a hemispherical pocket below its outlet, forming the bottom wall of the vaporizer and its least heated part, as exhaust passing down and out will not sweep the bottom of the pocket at all. It is on its upward return passage that heating is expected in this vaporizer, for here the mixture directly sweeps the exhaust walls with inward extensions, and it is this upper part that is directly heated by the exhaust. In general direction, the mixture flows similarly in the Koerting.

first downward with heavy drops separating out, then slowly across and upward at low velocity, but the reversal is less abrupt and the bottom the most heated part, though not strongly heated because it is located in a sort of exhaust dead-end, the degree of heating being controlled by changing flanges and diaphragms.

In every device except the Petreano, and in part the Durr, these heated surfaces are made of cast iron and all are extremely heavy, indicating that no importance is placed on quick starting, because initial heating time is, other things being equal, directly proportional to the weight of metal to be heated. Cast iron is, moreover, a necessary material for complicated passages, which must be formed by casting, and it is a natural selection for parts intended to be operated normally at a red heat, as is the case in nearly all of these. Red heats are necessary when kerosene is to be vaporized, with only a small part of the full amount of air, though not at all required when all the air passes through the vaporizer in contact with the oil, or when alcohol is to be vaporized. The importance of this air factor in required temperature is not recognized in some of these constructions, as is indicated by the passage of only a part of the air through the Brouhot, Thornycroft, Crossley, Fielding and Platt and Capitaine, while a full air passage is provided in the Martha, Petreano, Durr, Koerting and Campbell vaporizers.

Control of Air Fuel Ratio in Vaporizers.

The proportionality between air and fuel at the constant value required for combustion that is necessary not only for best vaporization conditions, but even more for the proper combustion of these heavy vapors, is controlled in still more various ways. The one best arrangement, that of the ordinary gasoline carburetor, of particular value when all the air is in contact with the vaporizing liquid, is used in the Martha, Brouhot and Thornycroft; mechanical means of doubtful value for throttle governed engines because of variations in feed are used in the Durr, Koerting and Campbell, but in the hit-and-miss governed engines where there is no graduation of feed, it is perfectly well suited, because here a constant feed per stroke can easily be fixed mechanically with precision to enter with the constant air charge, whenever the governor permits any admission at all, as is the case with the Crossley. Where throttle controls are used, no recognition is found of the importance of the throttle location, which should be before the vaporizer, so the latter may be under the least possible pressure to promote vaporization, and not after, as in the Thornycroft and Koerting, because here the mixture pressure never falls below atmosphere in the heater and vaporization is not helped.

Any bad adjustment of the proportions in the direction of excess fuel, or the use of bad lubricating oil or an excess of it, will produce smoke and cause exhaust deposits of carbon on the outside of these vaporizing passages. This layer is highly resistant to heat transmission, and as

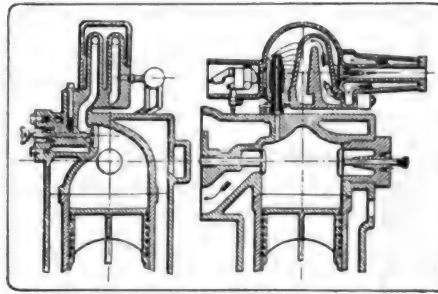


Fig. 10—Crossley Vaporizer.

such a layer accumulates the heat received by the mixture lessens, until a point is reached where vaporization is incomplete and unsatisfactory. At this time the exhaust side of these vaporizer heater walls must be cleaned, but it needs but a glance at those illustrated to see that this is difficult if not impossible in some cases. It should be noted here that if the walls are hot enough, such ex-

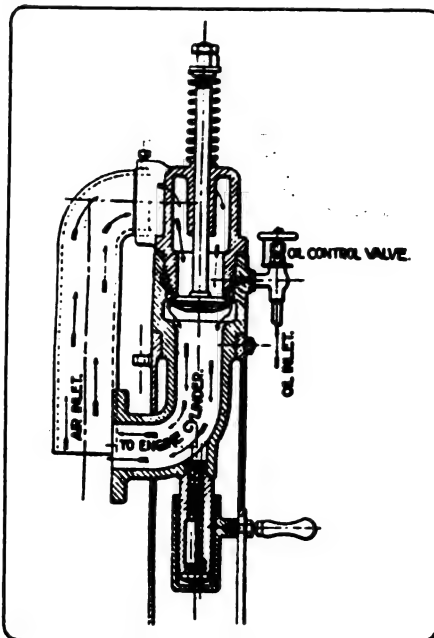


Fig. 11—Campbell Vaporizer.

haust smoke carbon will not deposit. This is true, for example, with the externally ribbed form of the Capitaine, Fig. 14, and the tortuous passages of the Crossley or Fielding and Platt, Figs. 8 and 9. Internal temperature disturbances, such as overheating on the vaporizing side, especially when the oil is vaporizing in a more or less isolated pocket or corner out of and not vigorously scrubbed by the main stream, will

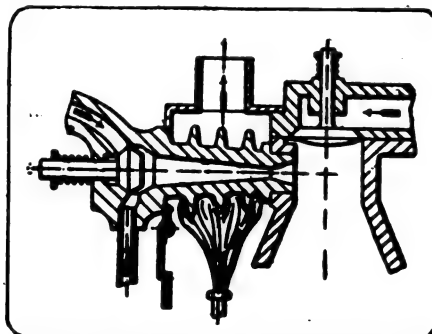


Fig. 12—Capitaine Vaporizer.

likewise cause deposits first of tar and later of carbon, which also must be cleaned out. The remedy is first to avoid such constructions and to provide heat-control means in the design, and second to make the vaporizing surfaces themselves cleanable, which is not possible in most of the forms illustrated, though all of them have been, or are now in successful commercial use for other classes of work than automobiles, where skilled care cannot be expected as in stationary or even marine installations.

In every case the mixture, consisting of all the fuel, and all or a part of the air, is supplied to these vaporizers in what has been called the rainy state, and as a result there is an early tendency for this to locate on the walls, which tendency is promoted by changes of direction of flow. As already pointed out, a wall film thus formed will tend to concentrate on the low velocity side of the passage, or drop by gravity or inertia into a pocket, if there is one, instead of distributing over it uniformly. An increased heating surface or size of vaporizer will then be required, and a higher temperature will be necessary to produce dryness just in proportion as these effects are different in one construction as compared with another.

Exhaust Heat Governs Vaporizing Conditions.


At low loads the available exhaust heat is not only less in quantity than at full load, but in throttle controlled engines it is at a much lower temperature normally. For this reason the vaporizing conditions do not remain the same in these vaporizers as the load changes, the tendency being toward deficiency at light load or excess heating of mixture at full load. Low load vaporizing deficiency is corrected in many of the stationary oil engines by using an oil lamp or torch, and even in extreme cases by relying on it entirely, as for example, in the Crossley and Capitaine forms. Of course, this is not admissible in automobile engines, which must rely entirely on exhaust heat for operation, though there can be no objection to a torch or burner for initial starting heat. Exhaust by-passes are provided in the Brouhot and Thornycroft forms to be operated by hand, which also is not permissible in automobiles.

Where exhaust heat is relied on, the vaporizer is large and there is clear evidence of an effort to provide extended heating surface. Small size is secured only where intense oil flame heating is used, as in the Capitaine. Large heating surface would be necessary if only a small and fixed amount of heat were available for transmission through or mixture absorption from each square foot, and this is the prevailing idea of these older designers. It conforms to the old ideas of steam boiler practice, now abandoned in the light of better knowledge of the laws of heating transmission, which recognizes that the old heat "soaking" theory of constant rate is wrong, substituting for it the modern high velocity "scrubbing" theory, according to which the heating rate is not constant, but increases with velocity.

(To Be Continued.)

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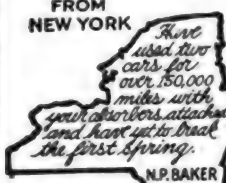
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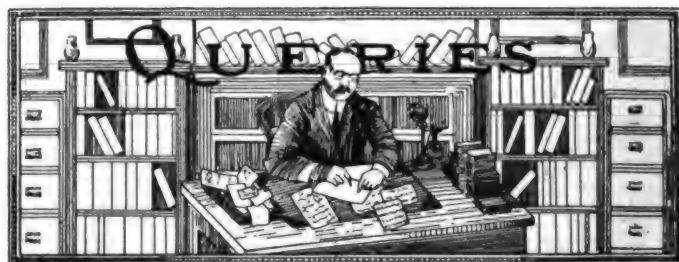
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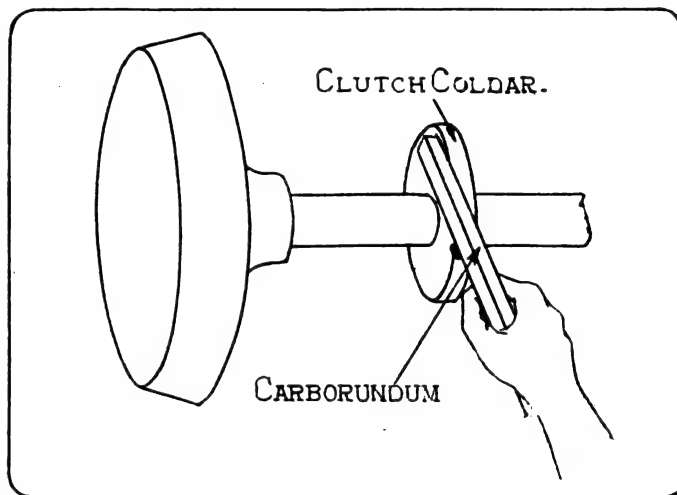
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NOISY CLUTCH ROLLERS. (S. H. D., Bridgeport, Conn.)

The clutch rollers on my — car are quite noisy. Recently I had new ones fitted and this reduced the noise somewhat, but did not stop it altogether. When I pull the clutch pedal back, so that the rollers do not touch the collar, the noise stops. The rollers appear to be perfectly smooth and round. Do you think the collar is out of true and, if so, is there any way that it can be repaired, as it seems to be quite hard, so that it would not be possible to turn it down in a lathe?

We think it more likely that, instead of running out of true, the hardened steel plate which the rollers engage has one or more soft spots, causing the surface to become slightly indented. If you will examine it carefully you will be able to see these spots. If they are not too deep it is a comparatively easy matter to dress the surface down until it is smooth, using one of the small carborundum stones which are used for sharpening pen knives and which may be purchased from any hardware store. Have the engine running



How to Dress Down Surface of Clutch Collar.

and simply press the stone squarely against the collar face, using a little oil on the stone occasionally. The job may be done more conveniently if the rollers and the fork which carries them are removed. A coarse stone may be used at the start and a fine stone for finishing.

CONVERTING A FORD CAR. (W. J. G., Pittsburg, Penn.)

I want to cut down a Ford car to a racer, although I am satisfied with a maximum speed of 50 miles. Of course cutting down the body will decrease wind resistance and I figured on changing the gear ratio on high to three to one. Now will a regular Ford engine pull over stiff hills on high at this ratio, or will aluminum pistons have to be added to get increased power? It is very hilly around here and, of course, a Ford that could not pull them on high would not be desirable.

Relative to gear ratio of a converted Ford "racer," a three to one reduction will be permissible, provided that you are willing to sacrifice some of your present hill climbing ability to get greater speed. The car is so light, in proportion to its engine power, and has such unusual performance on hills,



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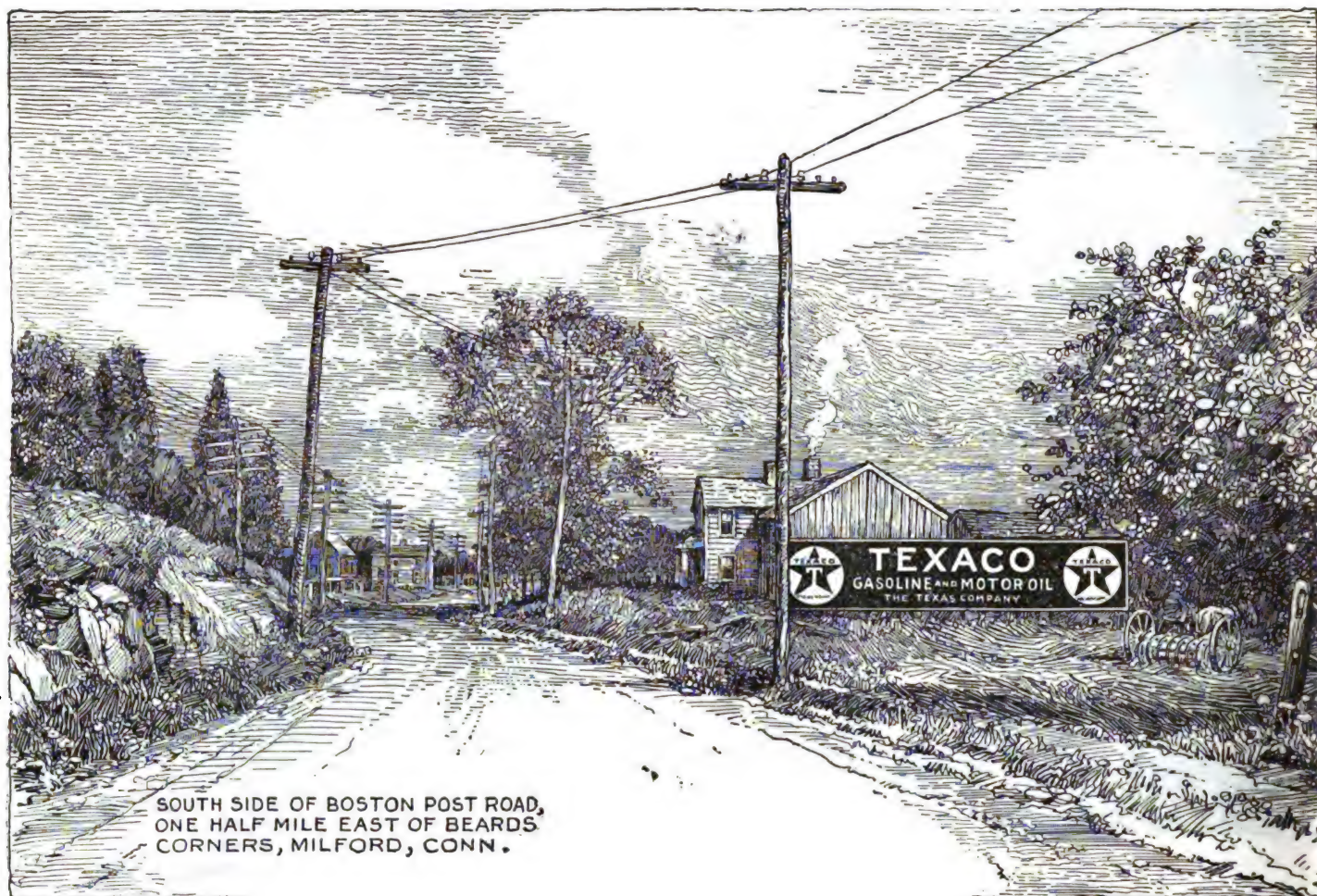
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that, with your engine kept well tuned up, and using a light body to carry one or two passengers, you will doubtless be able to negotiate all but very stiff grades.

If your motor has had quite a lot of use it would be well to consider the advantages of having the cylinders rebored, and over size alloy pistons fitted with high grade rings. These changes are now made by a number of firms at a price which is quite reasonable, and the expense is certainly justified if it is desired to get increased speed. It might pay you, also, to use an oversize carburetor.

Your cooling system should be kept in good shape; i. e., the fan belt kept tight and the radiator clean, as there will be a tendency to overheat. The radiator overflow might be connected to the carburetor suction with a rubber tube or flexible pipe, which will assist cooling somewhat and convert any steam generated to a useful purpose.

Needless to say, your valves should be in good shape, and the tappet clearances reduced to the safe minimum.

The car will hold the road better if the rear spring is weakened by the removal of one or two leaves.

SIX-CYLINDER FIRING ORDERS.

(J. A. K., College Point, L. I.)

As a constant reader of your journal, would like you to inform me of all the possible firing orders of a six-cylinder motor.

There are four possible sequences in which firing order may occur in an engine (six-cylinder) having its cranks follow at an angle of 120, and as many more in an engine whose cranks follow at 240, these being as follows:

In 120 crankshaft:	In 240 crankshaft:
1-2-3-6-5-4	1-3-2-6-4-5
1-2-4-6-5-3	1-4-2-6-3-5*
1-5-3-6-2-4*	1-3-5-6-4-2
1-5-4-6-2-3	1-4-5-6-3-2

The two sequences marked with asterisks are the ones

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generally used, the reason being that with such an arrangement alternate firing impulses occur in the front and rear group, causing less interference in the exhaust manifold than if adjacent cylinders fired in succession.

Since the 240 crankshaft is the more common, the firing order 1-4-2-6-3-5 is the one usually found in the average American car, although there are exceptions, such as the Locomobile, Oakland and a few others which have the 120 crankshaft arrangement.

AGAIN THE RUMLEY-OLDS ENGINE.

(L. N., Maddock, N. D.)

I must say I was glad to see your letter (published in July 25 issue, page 44,) regarding that engine. The engine knocks just when it is made to pull hard. It will not run after the engine is switched off even if the water is boiling in cylinder. I feed the engine 30 drops of oil every minute. But when the engine is running there is a needle valve which is open. When new it would run on half turn, but if I set the needle valve it will knock and pound like pounding with a hammer. But if you give it three-quarters turn on needle valve it will not pound. The spark is timed O. K. Main bearings are in good condition. The knock seems to come from the mixer and needle valve. When the engine gets plenty of gas it will not knock and when it gets little gas it will knock hard.

Referring further to the trouble you are having with your stationary engine, it seems quite evident, from what you say in your last letter, that the knock in the engine is caused by weak mixture. It is impossible to say, off hand, just why it should be necessary to open your gasoline adjustment to three-quarters of a turn to get good results, whereas it formerly ran well on a half turn, but there are several possible explanations for this.

It is possible that you have an air leak in the intake manifold, so that the mixture is weakened in two ways; i. e., by

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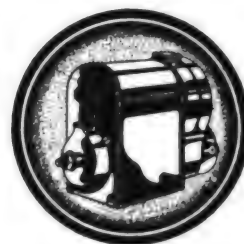
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reducing the vacuum in the manifold, thereby reducing flow of gasoline from the jet and by diluting the mixture with the air which enters at the leak.

Possibly the fuel level in float chamber is lower than formerly, resulting from the float arm being bent or from the fact that the gasoline which you now use is heavier than before, causing the float to ride higher and shutting off the float valve earlier. The presence of dirt, or other obstruction, in the gasoline pipe, or in the passage between the float chamber and the jet, would cut down the flow, necessitating greater opening of the adjusting screw. This, in all probability, is the right explanation of your trouble, and you should disconnect the gasoline pipe and clean it out, and also clean out the carburetor or "mixer."

PISTON CLEARANCE—GEAR SETTING.

(G. S. M., Erie, Penn.)

How much clearance should a new piston have in a cylinder? In adjusting a pinion gear to the ring gear, should inside edges of gears be even with each other or should pinion extend in a little?

Difference in piston and cylinder diameters is a better and more satisfactory manner of expressing clearance, and cannot be confusing. In good engine practise the skirt or bottom of the piston should be .005 smaller than the cylinder diameter. The land or portion of the piston between the top or head and the first ring should be .015 smaller than the cylinder diameter if the engine is intended for very fast work. A fairly safe rule is to allow the difference stated for the bottom of any piston and to allow an increase of .001 for each inch of piston length. This would afford .011 or .012 for a five-inch piston land, which will be sufficient for an engine intended for average service. Between the top and the middle ring the piston diameter should be .008 or .009 smaller than the cylinder, and between the middle and the third ring (if there is a third ring above the wrist pin) the diameter should be .007 or .008 smaller than the cylinder. Below this point the piston should be the same diameter as the skirt.

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This does not allow oil grooves or recesses, which may be desirable. These figures apply to good workmanship and good engine efficiency. The S. A. E. standard allowance for what is known as oversize piston rings is .020 in excess of the diameter of the original rings.

In adjusting a pinion and master or ring gear the teeth should mesh the entire length and should not overlap. Setting such gears is a matter for great care and after the pinion has been placed in the housing the pinion shaft should be forced home by heavy pressure, even by use of a bar, to insure against anything preventing complete seating of the thrust bearing. When the pinion shaft bearings are fully seated and this condition is obtained the master gear should be set so that the teeth mesh the full length with the pinion teeth. Unless the gears are set exact friction will develop and loss of power and unnecessary deterioration will result. When gears have been carefully set and well lubricated they will require comparatively little attention for a long period.

ANTI-FREEZING SOLUTIONS.

(J. H. A., Columbus, O.)

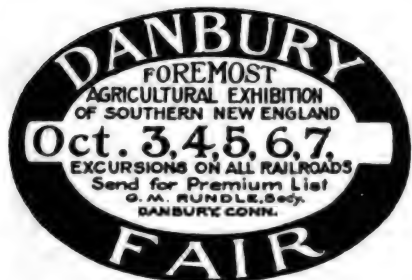
Kindly advise me the number of pounds of commercial calcium chloride to a gallon of water to prevent freezing at various temperatures. You published this some months ago, but the book was given away and I want this information for present use.

Herewith is a table indicating the relation of freezing points to mixture proportions. The figures in the first column indicate the number of ounces of calcium chloride to be added to a gallon of water, while those in the second column are the freezing temperatures.

Ozs. per gallon	Freezing point	Ozs. per gallon	Freezing point
10	27	20	21
30	15	40	5
50	-10	60	-38

It should be noted that, in using this chemical, it is essential to obtain the chemically pure article, as ordinary com-

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mercial calcium chloride has a slight acid content, which renders it injurious to the metal surfaces unless neutralized by soda ash or other alkali.

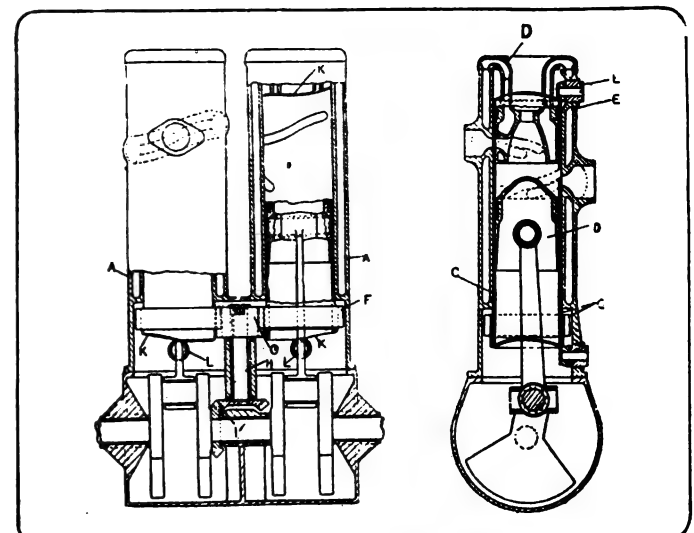
THOMAS SLEEVE VALVE ENGINE.

(W. J. S., Cincinnati, O.)

Some time ago I read a description of a sleeve valve motor that had been invented by a British motor engineer, whose name, I believe, was Thomas. Is it asking too much for a description and illustration of this motor in the Queries column of The Automobile Journal?

A side and end elevation of this engine, partly in section, are shown herewith. It will be seen that it resembles, in general characteristics, the well known Knight motor, but differs from the latter in having but one sleeve, and also in the method of actuating same. This valve sleeve has both a vertical and a rotating motion, and has helical openings, or ports, near its upper end, which are made to alternately register with the intake and exhaust ports, which are arranged in the cylinder wall on opposite sides, as in the Knight motor.

A continuous rotating motion is imparted to the sleeves by a spur pinion (G), which meshes with toothed rings (F) at the lower extremities of the sleeves, this pinion being keyed to or integral with a vertical shaft (H), which carries a bevel gear at its lower end, meshing with a bevel gear on crankshaft. Vertical motion, in an upward direction, is given to the sleeves by having the lower edge curved and resting on



Sketch of Construction of Thomas Sleeve Valve.

an idling roller (L) mounted on a fixed stud. Downward motion is equally positive by having the same arrangement at the top, the contour curves, or cam surfaces, at the top and bottom of sleeves being, of course, parallel.

An inverted, or re-entrant head extends down into the cylinders, sealing the top of the sleeves by means of piston rings, as in the Knight motor. Just what claims are made for this valve gear by its inventor are not perfectly known, but it is apparent that the number of reciprocating parts has been reduced (as compared with the Knight) by the elimination of the eccentric rods and additional sleeve. It is probably also claimed that port leakage is prevented by having the sleeve ports travel a considerable distance from the cylinder ports (by virtue of the rotary motion) before combustion takes place, thus obviating the necessity of using an additional sleeve. So far as known, the motor has not been developed beyond the experimental stage.

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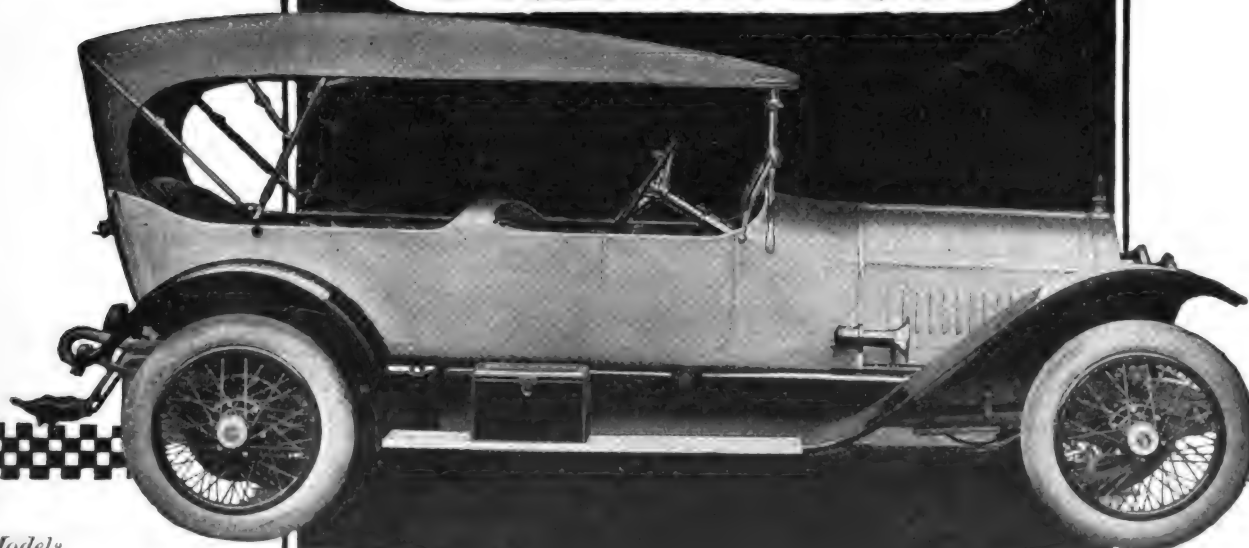


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a Copy

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NO. 4.

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Treasurer - - WILLIAM H. BLACK
Secretary - - - - D. O. BLACK, JR.

Published the 10th and 25th of each month by the

AUTOMOBILE JOURNAL PUB. CO.,
Times Building, Pawtucket, R. I.

A DEQUATE Means for protecting cars against theft should be provided by every owner. The effect when a car is stolen is not only the loss of the machine itself, serious as it may be to the average owner; the influence is felt in the advance of insurance rates and the consequent placing of another burden on motorists. An instance of this is found in the recent action of a western insurance organization, which, finding that the number of stolen cars is on the increase and that the number unrecovered is growing alarmingly, has been compelled to increase its rates.

A MOTORIST Will Demand adequate protection for his coat or umbrella in a theatre or restaurant, willingly paying well for the service, but will leave his valuable motor car standing at the door without any protection at all. To say the least, such actions are inconsistent. A good lock, of which there are many on the market, can be purchased for a relatively small sum. Some of the more completely equipped cars are provided by the manufacturers with means for locking the machines when desired. If the practise were adopted by every manufacturer it would be greatly appreciated by the purchasers of their products.

IT HAS Been Said that there are few if any locks that will prevent a determined thief from making off with the car. Even if this claim were true, and it is yet to be proven, a locking device certainly acts as a deterrent. No one, and least of all the "professional" thief, who is not prone to taking chances that can be avoided, will spend much time fussing in public thoroughfares with a car that is locked. In choosing between the car that is protected and one that is not the thief certainly will "pass up" the first mentioned for the second.

AN EFFECTIVE Means for Lessening the number of car thefts has been inaugurated by several automobile clubs and similar organizations. Nebraskans in the Lincoln club have devised what is probably one of the most comprehensive and practical plans. This is described in a letter to the Editor by the Secretary of the club, a summary of which appears in this issue on page 13. The plan, or at least the main idea, which is "co-operation," could be beneficially copied by other organizations throughout the country.

AUTOMOBILE Clubs are in a position to be of considerable service to their members and to motorists at large. Some are; others are maintained merely for social purposes. Among those to be included in the first classification are the clubs that are agitating for uniform laws, good roads, sane driving and the other good causes now before the motoring public. In the matter of dimming headlights there is still room for constructive work. The Automobile Club of Hartford, Conn., one of the most progressive in the East, is arranging to make public demonstrations of dimming and glare eliminating devices for the benefit of not only its members, but of all motorists in Hartford and nearby cities. The demonstration is to be held Oct. 3 at Charter Oak.

SUMMER Has Departed. The season for closed cars is now at hand, and the manufacturers of closed cars and the makers of special bodies are reporting a big selling season in prospect. The majority of motorists have learned that it is not necessary to lay up the car during the winter, especially since means of keeping warm and dry are to be had at a reasonable cost. Readers who have open cars will be interested in the article to appear in an early issue on the subject of "ready to mount" closed bodies.



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How often have you heard the repairman, machinist or shop manager say, "It's the same old Coes, just as good as the day I bought it—it will last forever."

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Coes Wrenches made today are just as good as the Coes Wrenches produced 50 years ago.

The material is selected with the same care, made by equally experienced and trained wrench makers, in a factory which specializes in wrench making. The wrenches are finished carefully and many times tested to assure the quality that will meet every requirement placed upon them.

Car owners who know wrench values demand the Coes. It is most popular with automobile repairmen, and in every other line of mechanical work Coes Wrenches will be found on the benches and in the tool kits of the expert workmen.

Coes wrenches can be had in just the size to fit any use. Any Coes will afford the same long and satisfactory service. It is always dependable and from the standpoint of wrench service it is the cheapest wrench produced.

Coes wrenches are sold wherever motor cars are used. They may be had of all jobbers, automobile supply houses, and automobile and hardware dealers.

Catalogue on request.



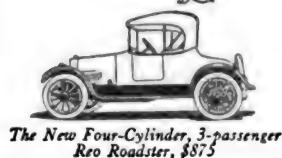
Coes Wrench Company, Worcester, Mass.



(When Writing to Advertisers, Please Mention The Automobile Journal.)



Oversold —Always Oversold



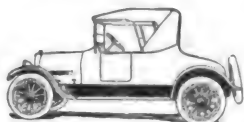
*The New Four-Cylinder, 3-passenger
Reo Roadster, \$875*



*The New Reo the Fifth, "The
Incomparable Four," \$875*



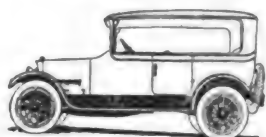
*The New Four-Cylinder Reo
Enclosed Car, \$1025*



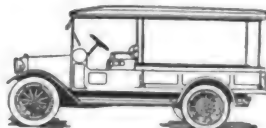
*The New 4-passenger Reo Six
Roadster, \$1150*



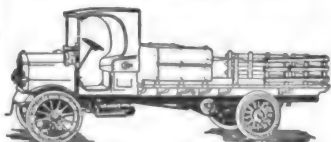
*The New 7-passenger Reo Six
Touring Car, \$1150*



*The New Reo Six 7-passenger
Sedan, \$1750*



1500-pound Reo "Speed Wagon," \$1000



*2-ton Reo Truck (Chassis only, with
Driver's Seat and Cab), \$1650*

All Prices are f. o. b. Lansing, Michigan

Wherever you see a Reo dealer you see one who has more orders than he can get cars to fill.

Oversold is a chronic condition with Reo distributors and dealers.

Has been so since the first Reo left Lansing.

Never since the first Reo was made and its quality shown, has it been possible for us to make enough cars to supply all who wanted Reos.

Of course it's aggravating to have customers waiting—begging—pleading—for more cars than you can supply.

But it's a mighty sight more aggravating to have a stock of cars on the floor you can't sell.

The last condition happens to most dealers—sometimes. To a Reo dealer—never.

Always there are more customers than cars.

And that is true also of Reo motor trucks.

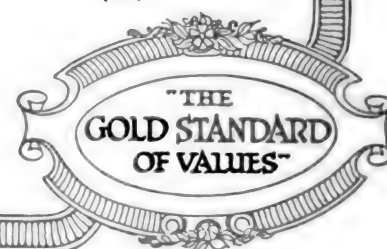
That's the kind of automobiles and trucks dealers like to handle—all the profit is net. Selling cost low—maintenance lower.

Perhaps you can't now—but it behooves you to watch: some day you may be able to get the Reo line.

**Reo Motor Car Company
Reo Motor Truck Company**

Factories: Lansing, Michigan

(160)



(When Writing to Advertisers, Please Mention The Automobile Journal.)

The Automobile Journal

America's Greatest Military Training School for Citizen Soldiers, Plattsburg

SEPTEMBER 25, 1916.

VOL. XLII.

NO. 4.

**A Six Day Motor Trip Through the Hudson
Valley One of the Most Historic and
Picturesque Sections of the United States.**

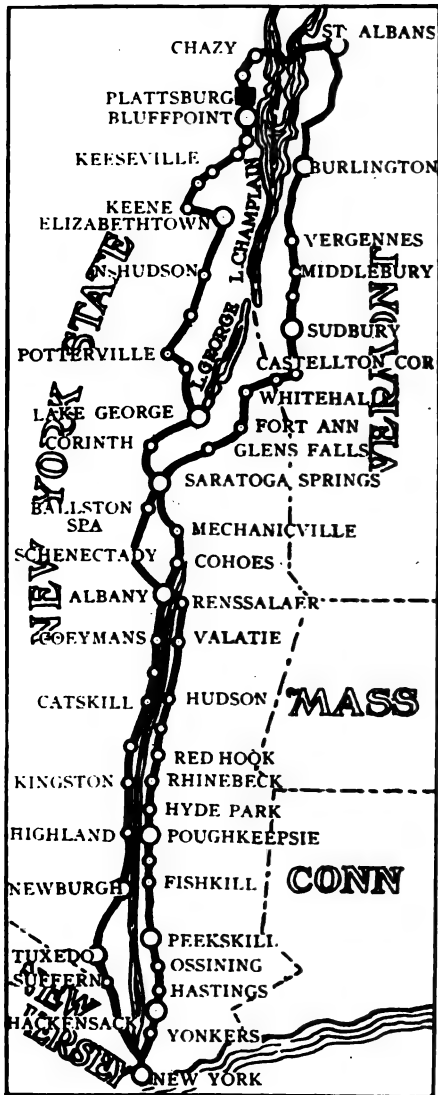
THOUSANDS of motorists have this year gone to Plattsburgh, N. Y., to see the famous training camp there for civilian soldiers. Many tourists have visited that now well known army post to see their friends in training, while a large number have made the trip because it is one of the most beautiful in America east of the Mississippi river. It can be reached from almost any part of New England, New York state or Canada by direct routes, but the most interesting and pleasurable route is that from New York City.

This route lies in the beautiful Hudson valley on the east shore to Rensselaer, where a crossing is made into Albany. From there the road goes along the west bank of the Hudson, passing Saratoga lake into Saratoga Springs, which for many years was the leading inland watering place of the United States. The springs for which the place became famous, about 30 in number, were known to the Indians centuries ago. Saratoga is also known as the gateway of the Adirondacks, where thousands of New Yorkers go every year for hunting, fishing and camping.

Continuing in a northerly direction the route runs into that scenic section of Vermont laying along Lake George and Lake Champlain, and passing



Along Ausable River, Near Plattsburg and Lake Champlain; Above, the Lake Shore Drive Leading Past Lake George Toward the Military Training Camp.



The Tourists' Route Map.

through Sudbury, Vergennes, Burlington and St. Albans. From the latter place a part land and part water route is taken over to Chazy on the west bank of Lake

Champlain, which is an excellent trip.

Foothills of the Adirondacks.

The tourist is now within a few miles of the beautiful camping grounds on the shore of the lake and in the foot hills of the Adirondack mountains. The camp overlooks Cumberland bay and was started two years ago as a training grounds for business men who wished to become proficient in the manual of arms. Only about 1000 attended the camp in 1915, while this year over 7000 have participated in the drilling manoeuvres there.

The gathering at Plattsburg has been of the most cosmopolitan character, bankers, millionaires, scientists, professors and professional men drilling shoulder to shoulder with clerks, students and men from the laboring ranks. Manoeuvring across the training field under the direction and instruction of the U. S. army officers, this body of citizen soldiery, in the making, is one of the most impressive sights in America today. Practically every one of the men gathered at the camps are new to the manual of arms and few, if any, ever shot off a regulation army rifle before; but they show the greatest enthusiasm and go through the drills, which are really hardships to many, owing to their poor physical condition, without flinching.

This aggregation of men from all walks of life shows that the spark of patriotism is still strong in all Americans. Upon only a slight hint of the possibilities of warfare, they have left their work, and in some cases, a life of ease, to go to Plattsburg and undergo the strenuous ordeal of military training. A redeeming feature of the training, however, is the splendid drilling ground and location of the camp, on a spot that would be selected by many if one were seeking a retreat by the lake-side or mountain foothills in which to pass the summer.

The environment of the camp is most inspiring and healthful, and the sanitary arrangements are ideal, they being under the direction of U. S. army engineers. From present indications, the encampment will be continued next year.

The return trip is made southward through the eastern fringe of the Adirondacks and lays through a country that for scenic grandeur and beauty has no equal in this country. The mountains stretch out in long chains, breaking up the horizon on the west, while to the eastward lies a net work of lakes and streams which as a whole resemble a gigantic park system. In the fall of the year the ride down through Elizabethtown to Lake George is enchanting. The atmosphere has a noticeable crispness and is clear and dry, which, combined with the scent of the mountain air and turning foliage, creates an environment that is greatly exhilarating.

Lake George is at the southern ex-



An Angler's Paradise in the Foothills of the Catskills.

tremity of the lake by that name and has figured prominently in American history for nearly 300 years. Fr. Isaa Jogues, a French priest, discovered the lake in 1642 and he was killed there by the Iroquois Indians in 1646. General Johnson, who camped at its head in 1755, gave the lake its present name in honor of British King, George the Second. It has often been called Horicon, as this name was used in referring to it by James Fenimore Cooper in his famous stories, which were based on Indian life and settlements about the lake. It was also the scene of battles between the French and English and the French and Indians.

Reminders of the Revolution.

The ruins of Fort George, which was built in 1759 by Amherst, still stand in the state park east of the railway station in Lake George. During the revolutionary war the fort was used by an English command as a military post until Col. Bernard Romans captured it in 1775. The spot is now marked by a battle monument erected there in 1903 by the Society of Colonial Wars to commemorate the event.

The country is rich in historic lore, as well as impressive and beautiful scenery. The route from Lake George to Saratoga lies through Corinth, a picturesque town, and also intersects several small villages. From this point the same route as was taken on the trip up from Albany may be followed in returning. Another way, slightly longer, passing through



Trees and Lakes Combine to Make Beautiful Scenery.

Ballston Spa and Schenectady, offers the tourist scenery and points of interest that warrant the extra driving. At Schenectady are the great works of the General Electrical Company and a number of other thriving industries.

Entering Albany the tourist should continue on through Central avenue on to State street as far as the State capitol, which is one of the finest specimens of French renaissance style in America. The building was in the course of erection for over 30 years, during which time more than \$25,000,000 was spent upon it.

100 Miles Along the Hudson.

From Albany to New York City the road runs close to the west bank of the Hudson river for nearly 100 miles into Newburgh, and through a section that became famous in Colonial times owing to its close identification with the movement of the Continental armies. Kingston, one of the places passed through on this leg of the tour, was the first place of meeting of the New York state legislature in 1676. It was burned by the British in 1777.

Newburgh, the last stop before winding through New Jersey to the New York ferry, is situated in a wonderful location on the banks of the Hudson and presents a grand picture from the river, with the water in the foreground and the mountains in the distance. It was settled by refugees from the Franco-German war in 1708 and was named Newburgh in

and where Peter Townsend forged the chain that was stretched across the river to prevent the British ships from sailing past the city.

Polopel Island, which was a famous military prison during the war for freedom, is nearby on the river, as are many other famous land marks that were better known over 100 years ago than they are to the present generation. The old court house, which is opposite the hotel, is one of the imposing specimens of architecture of which there are quite a number. A fine view of the surrounding country may be obtained from the observatory in Downing park, and the tourist will find a visit to the Temple Hill monument very interesting. It marks the site of the general headquarters and the temple in which the society of the Cincinnati was first organized and where the first meeting of that famous organization was held.

The tourist who is well posted on Revolutionary war history will enjoy this section of his trip more than any other part and can spend a long time in delving into the archives that are available, in addition to sight seeing among the historic spots so closely identified with the nation's birth. In an environment of this nature the joys of touring are multiplied, the water and land scenery having twofold interest on account of its historic connections.

Out of Newburgh the road runs along the route of the Erie railroad and the Ramapo river into Tuxedo, where there is a colony of very wealthy New York people, who maintain many palatial residences about the city and

Tuxedo lake. The route continues along the west bank of Ramapo into Hillburn, where a bridge is crossed leading into Suffern, the last place in New York state. The remainder of the trip is through Ridgewood and Hackensack, N. J., to Edgewater, where the ferry, which runs every 20 minutes, is taken for 130th street, New York City.

Generally speaking, this trip should not require more than a week from start to finish, allowing for a day at Plattsburg, or any other place the motorist may choose. The total mileage for the round trip is approximately 712 miles, the outward journey being about 369 miles and the return 343 miles.



Anthony's Nose and Rogers' Rock on Lake George.

ITINERARY.

New York-Poughkeepsie.

Miles	Miles
New York.....0.0	Peekskill.....40.6
Yonkers.....12.7	Cold Spring.....52.0
Irvington.....20.4	Fishkill.....59.8
Tarrytown.....23.1	Wappinger's.....67.4
Ossining.....29.3	Poughkeepsie.....74.8

Poughkeepsie-Albany.

Poughkeepsie..0.0	Stuyvesant F...50.0
Hyde Park.....6.1	Kinderhook.....53.8
Rhinebeck.....16.2	Schodack.....67.3
Red Hook.....22.1	E. Greenbush...69.0
Blue Stores....31.1	Rensselaer....73.5
Hudson.....41.3	Albany.....74.5

Albany-Saratoga.

Albany.....0.0	Mechanicville..22.6
Cohoes.....12.1	Maltaville.....28.7
Waterford.....14.0	Saratoga.....39.0

Saratoga-Sudbury.

Saratoga.....0.0	Whitehall.....43.1
Glens Falls....19.0	Fairhaven.....53.6
Sandy Hill....22.7	Castleton Cor..57.0
Kennedy.....27.2	Sudbury.....61.0

Sudbury-Burlington.

Sudbury.....0.0	Shelburne.....41.0
Cornwall.....10.7	Burlington....47.9
Vergennes....25.9	

Burlington-St. Albans.

Burlington.....0.0	Milton.....16.0
Winooski.....3.0	Georgia.....22.0
Colchester.....8.0	St. Albans....28.0

St. Albans-Plattsburg.

St. Albans.....0.0	Isle La Motte..26.0
Swanton.....9.0	Chazy Landing..28.0
Swanton Ferry.18.0	Ingraham.....34.2
Albany Centre..21.5	Plattsburg.....43.0

Plattsburg-Elizabethtown.

Plattsburg.....0.0	Upper Jay.....37.3
Keeseville....15.8	Keane.....43.4
Ausable.....27.6	Hull Corners...45.4
Jay.....33.6	Elizabethtown..56.1

Elizabethtown-Saratoga.

Elizabethtown..0.0	Warrensburg...62.8
Scroon River...22.6	Lake George...69.3
Pottersville...41.2	Glens Falls...79.3
Chestertown...50.1	Saratoga.....97.5

Saratoga-Albany.

Saratoga.....0.0	Schenectady...22.6
Ballston.....6.7	Albany.....37.6
Burnt Hills....14.3	

Albany-Kingston.

Albany.....0.0	Evesport.....44.7
Coeymans.....13.4	Saugerties....47.9
Coxsackie....24.6	Glenrie Falls..50.7
Catskill.....35.9	Kingston.....59.6

Kingston-Newburgh.

Kingston.....0.0	Marlboro.....26.3
Ulster Park....7.5	Newburgh.....34.9
Highland.....17.8	

Newburgh-New York City.

Newburgh.....0.0	Ramapo.....31.0
Vails Gate.....4.8	Suffern.....32.9
Highland Mills.13.5	Hohokus.....41.7
Southfield....21.7	Hackensack....51.4
Tuxedo.....26.4	130th St. Ferry.58.2



Such Scenes as This Abound in the Catskills.

1743. The old Hasbrouck house, which was used by Gen. Washington as headquarters in 1782-83, is the principal point of interest in the city and is visited by hundreds of tourists. The "Tower of Victory," which was erected to commemorate the close of the Revolutionary war, stands in the park that was formerly the grounds of the Hasbrouck house. From this point Beacon Hill, on the other side of the Hudson, may be seen. A monument now marks the spot on the hill where fires were burned during the Revolutionary war. There are numerous other points of historic interest about Newburgh, including the Old Mansion, where the "Dutch loan" was deposited

BRITISH TANKS MADE IN U. S. A.

Mysterious Land Battleships Are Prosaic Holt Farm Tractors, Says M. M. Baker.

One of the most sensational of the highly colored tales that has ever come out of war ridden Europe concerned a type of motor vehicle which was likened to a battleship on land. Such accounts as were permitted to pass by the Allies censors invested the machines with almost super-human abilities, as well as origin. The mystery was allowed to prevail in America for about 48 hours, when it was dispelled by M. M. Baker, vice president of the Holt Manufacturing Company, who claimed that the "tanks," as they were called, were nothing more than Holt agricultural tractors, with improvements or adaptations to suit the purposes of war and the terrain over which they were obliged to travel.

The Holt concern had sold a thousand of these machines to the British government, and supposedly reliable authorities stated that they had been used as the basis for the armored "tanks" that wrought such terrible havoc with the opposing forces at the battle of Comblès, where they made their first appearance. These tractors develop 120 horsepower and weigh 18,000 pounds each. They travel on caterpillar wheels, through which they are also driven.

This arrangement, which gives them a traction contact of over seven feet, enables the machine to proceed against barriers and obstructions that would be insurmountable with the ordinary truck wheel and this feature is the one that lead to their use against the enemy. The

vulnerable parts were enclosed in heavy armor and they were equipped with heavy calibre machine guns. A large, wide, single front wheel enables the machines to cross gaps nearly as wide as the length of the rear caterpillar wheels.

These machines were first used for hauling heavy field guns from one position to another, a work for which they had been tested by the U. S. army officials with successful results. But the credit for their use as armored "land battleships" is said to belong to Winston Churchill, who first conceived the plan of equipping them for offensive fighting.

The value of these machines, as previously stated, lies in the peculiar method of locomotion, which resembles that of the caterpillar. It progresses with a crawling motion actuated by revolving metal belts running over a radius of seven feet on two large wheels and held flush with the ground by two steel rails with cogs to relieve friction. Swamps, logs, barbed wire entanglements, shell craters and other obstructions that proved impassable barriers to the ordinary four-wheel trucks are said to be easily negotiated by these machines.

NEW TRANSCONTINENTAL RECORD.

Ralph Mulford and several other well known automobile drivers drove a Hudson Super-Six car from San Francisco to New York City in record breaking time,

averaging 27.14 miles per hour for 3476 miles.

The car left San Francisco on Wednesday, Sept. 13, at 12:01 a. m. and entered Columbus circle, New York City, on Monday, Sept. 18, at 6:31 a. m., beating the former record by 14 hours and 59 minutes.

The drivers besides Mulford were Charles Vincent, W. Sturm, L. Kalinsky and A. H. Patterson. Patterson drove the car from San Francisco to Elks, Nev., where Mulford took the wheel and drove to Laramie, Wyo. Patterson again took the wheel, going to Omaha, where he was relieved again by Mulford, who drove into South Bend, Ind. From this point into New York City, the last lap of 910 miles, C. H. Vincent piloted the car.

OWEN MAGNETIC TOUR.

The second annual Owen Magnetic Tour, held under the personal direction of Ray M. Owen of the R. M. Owen & Co., of New York City, manufacturers of the Owen car with the magnetic drive, was a very successful trip. The 50 guests who made the tour in part or in whole were high in their praises of the riding qualities of the Owen magnetic car, as well as the beautiful scenery which they saw on the five days' outing from New York City into the White mountains and return.

There were 15 cars in the fleet. Many of the guests had never ridden in an Owen Magnetic car before and were constant in their praise of its easy riding qualities and the facility of control.

The weather throughout the trip was excellent and the days were devoted to touring, while the evenings were spent at the hotels or inns, where the party enjoyed the mountain air and the sociability that sprung up among the members. The itinerary included New York City, Great Barrington and Greenfield, Mass.; Hanover, Profile and Concord, N. H.; Boston and Pittsfield, Mass., and Hartford, Conn.

When the machines were returning through Central Park, New York City, the speedometers on the cars showed an average total mileage for the trip of 790 miles.

LONGER INDIANAPOLIS RACE.

Officials of the Indianapolis motor speedway have decided to make the International Sweepstakes race a 500-mile event, as it was originally, and a prize of \$50,000 will be hung up for the winners on May 30, 1917.

During the first four years that the Indianapolis classic was held the distance was 500 miles and the prizes totaled \$50,000 each year, but this year it was cut to 300 miles and the prizes to \$30,000. The restoration of the old programme will not only stimulate more interest in the annual classic, but will also attract all the best race drivers in this country, as well as many from Europe.

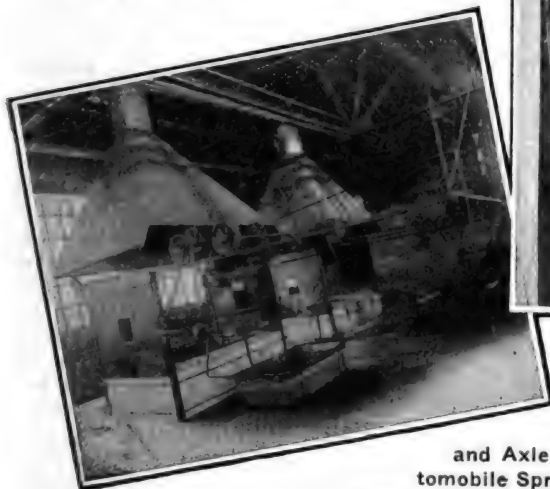
The race next year will be open to stock cars with a piston displacement of 300 inches or less.



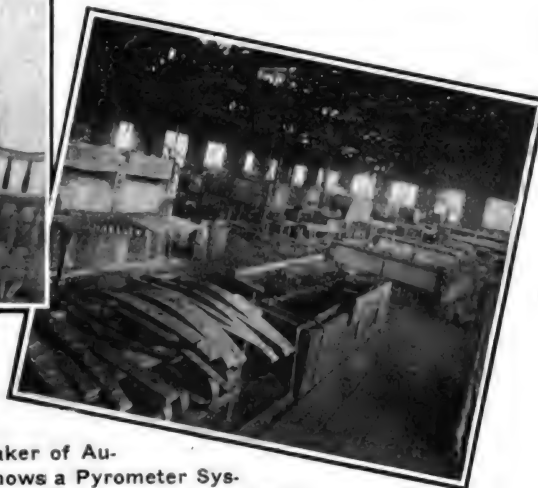
AMERICAN GENIUS BEHIND BRITISH "TANKS."

Here is the Nucleus of the Mysterious British "Tanks" Before Which German Troops Fled in Terror. It is a Holt Farm Tractor, Without the Armor and Other Adaptations Said to Have Been Made by the British. This Particular Machine is in Use on the Mexican Border for Hauling Heavy Artillery.

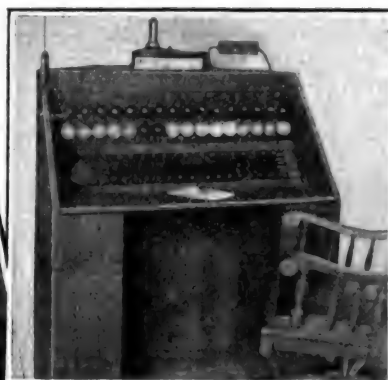
The Heat Treating Department.
Group of Large Heating Ovens.



Salt Bath for Tempering Metal.
Springs Ready to Be Immersed.



Views of the Heat Treating Departments of the Western Spring and Axle Company, Well Known Maker of Automobile Springs. The Centre Views Shows a Pyrometer System Switchboard, by Which Temperature of the Furnaces is Maintained.



The Part the Metallurgist Plays in Modern Automobile Manufacture.

IT SELDOM is in the thoughts of the motorist when he is speeding along that the mechanical creation he is driving is anything but the assembled product of the machinist, steam hammer, gigantic drop press and the foundry man. He has seen pictures of big factories, teeming with signs of industry, where his car was wrought from the crude iron pigs. These illustrations showed many pieces of machinery, varying in size and shape and multiplicity of gears, heads and tools. There were blast furnaces and foundries, all of which as a unit seemed fully efficient to make an automobile or any other complicated piece of mechanism.

The Metallurgist, the Real Magician.

While it is true that these great hives of machinery and men are essential to automobile production, the realization seldom comes to the lay man that back of all this ponderous mechanical equipment, the real foundation upon which it was built and which made it a possibility, lay in the movements of the scientific metallurgist or chemist in the quietude of his laboratory, where nothing of the spectacular is either witnessed or heard. It was, however, in these surroundings that the secrets of the automobile were evolved. It was a long battle of the human mind against the elements and natural law.

The tempering and alloying of metal is the real heroic subject of the romance of the automobile world. In fact, the modern car, both the cheap and expensive, stands as a gigantic memorial and monument to the efforts of the scientific man in the laboratory who delved into the atomic structure of the basic metals to find a combination and method of alloying that would produce the greatest structural, tensile, ductile and elastic strength.

Tempering and alloying of metals is not a new art, but it never became the science that it has now attained with the advent of the demand for specially hard and fibrous steels in the construction of motor cars and engines, which called for a material with qualities of unusual nature. Where tempering was formerly a haphazard process, as compared with present methods, it has now become almost an exact science through the use of special devices and apparatus which are installed in the big automobile plants and which make it possible for working men to handle the heat treating end of the manufacturing process.

This is one of the most vital parts of the production, as upon it depends the reliability and durability of the product.

Consequently, the heat treating department is important above anything else, although little is ever heard of it in the general run of publicity from the factories. In fact, the merit of any car lies largely in the heat treating process to which its various components are subjected. The springs, axles, driving gears, crank shaft and all other parts that bear the stress and strain have to be heat treated at some stage of their development from the steel ingot to the finished piece, and this operation in the larger plants is done scientifically and under the infallible supervision of automatic machines and apparatus that make for extreme accuracy.

The real quality and value is built into the machine in this process, yet it is not an element that can be seen by the eye, although it is quickly recognized as a missing quantity, as many automobile owners can testify when parts of their machines have broken, bent or smashed up on account of being improperly tempered. Heat treating is also the method by which the proper compound is obtained and by which the manufacturer rectifies any inferiorities in the steel that comes from the mill. Owing to the enormous demand for steel in Europe for war purposes, manufacturers have had considerable trouble in obtaining supplies of good quality owing to the haste and rapidity of production; but with the installation of heat treating equipment the steel can be brought up to the proper standard of both compound and hardness.

The old method of judging the color of a heated steel while tempering it has been abandoned by the modern manufacturer because where the process had to be conducted on a large scale the results obtained by depending on the judgment of the work man, based on his eyesight, were too uncertain to be reliable. Consequently, the installation of the modern heat treating equipment was made to secure a uniform material which would accurately measure up to expectations and give service to the user.

Temperature Automatically Controlled.

This equipment for heat treating usually consists of a number of ovens where the material is heated. All these ovens are connected up to a pyrometer, which is a device similar in appearance to a small telephone switchboard, only as the name suggests, it is a meter for registering temperatures. The automatic pyrometer records the temperatures automatically and is fitted with a device which keeps a record of each day's work. The foreman can go to the machine at any time and by turning a handle get a reading from the ma-

chine to see if the ovens are at the proper temperatures.

A signal board in the pyrometer room is operated by an expert who can tell by a glance at a dial whether or not a work man has the proper temperature in his oven. If the temperature is too high, or insufficient, for the work being done, the operator notes it and presses a button that flashes a signal to the oven attendant through the medium of different colored lights placed over the oven.

The engineers or factory chemists set the temperatures at which the parts are to be treated and the man at the pyrometer board is in a position to see that these orders are carried out in every oven. In this way the process of heat treating has become practically an exact science, and the individual parts in a thousand different cars are all of the same quality. It is no longer left to the frailties of human consistency to keep a product standard throughout, for no matter how conscientious the employee might be, he could not

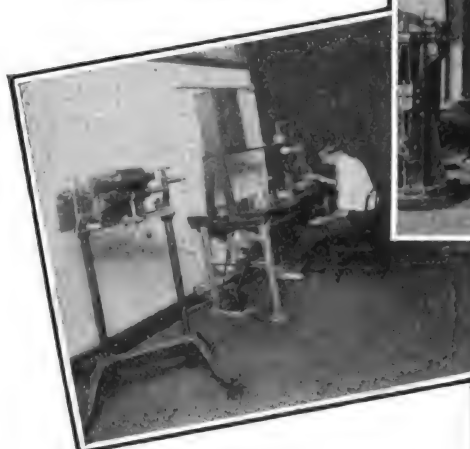
much lighter in proportion to the strains they have to bear than could be formerly obtained has led the automobile designer and engineer into realms of creation that, otherwise, they never would even have experimented with.

The Role of the Chemist and Metallurgist.

Some of the high priced motor cars, as well as the medium priced cars of today, have two and three times the power, speed and carrying capacity of their earliest progenitors and yet are less than half the weight. This has all been made possible by the research work back in the laboratory by the chemist and engineer and expert metallurgist, who not only developed the new steel compounds and methods of treating them, but also the invaluable apparatus that keeps the production of these new materials up to an invariable standard.

The wheels of industry may constantly spin in ever in-

Directly Below, View of the Microscopical Laboratory, Where Metal Is Examined by Micro-Photography.



At Top Centre is a View of the Several Types of Testing Machines Used in the Western Spring and Axle Company's Physical Laboratories for Determining the Quality of Steel Before It Enters



Directly Below, a View of a Metallurgist at New York at the Carbon Train in the Chemical Laboratory.



Heat Treatment Apparatus in the Physical Laboratory and at the Bottom an Upton-Lewis Fatigue Testing Machine. Into the Manufacture of Automobiles; Directly Beneath Is an Experimental

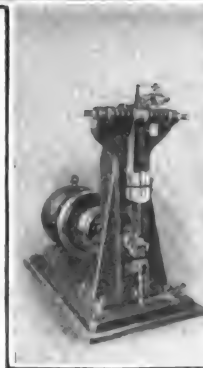
possibly avoid relaxing sooner or later, and this one defect that he was responsible for would do almost irreparable damage by causing an accident while the car was being used.

After being subjected to the proper temperature until the part has become heated to the tempering point, it is dipped in a bath of oil or water, which causes a sudden and rapid cooling of the metal and gives it the desired hardness. While the process has been scientifically controlled up to this point, and there is little danger of any wide variation in the hardness of the metal, further precautions are taken to determine beyond any doubt that the desired quality has been obtained.

The Test for Hardness of Metal.

The last test before the part goes into use and operation is that of the sclerometer, which accurately shows the hardness of the metal. This instrument is made of a glass tube set perpendicularly on an arm extending from an upright stand with a heavy iron base. A little drop hammer with a diamond point is enclosed in the glass tube. This hammer is controlled by a bulb and tube similar to that used on a camera. When the bulb is pressed it draws the hammer to the top of the tube, where it is released, dropping down onto the piece of metal to be tested. The distance which the hammer rebounds on the scale in the tube shows the hardness of the piece tested.

The development of this department of manufacturing has eliminated the guess work and made it possible to build a better product, for the availability of steel parts that are



creasing production, but their entire momentum is all gained from the original nucleus, which at first had its origin in the laboratory of the research scientist. This fact in its application to the automobile industry contains more truth possibly than in any other connection, although quality in anything but a painting or work of art is seldom visible to an appreciable extent to the naked eye.

Thus it is that the seldom heard of scientific research engineer can be called the magician of the motor vehicle industry. With his delicate instruments and apparatuses, not to mention chemicals, he is the guardian of the material that enters into every working component of the chassis; he is always on the alert to detect any flaws in materials that may exist before they have been incorporated into the automobile.

He is more largely responsible than any one else for the fact that nowadays one seldom hears of stripped gears. His methods of testing and heat treating have virtually eliminated the possibility of soft gears, pinions and other vital parts from present day motor manufacturing processes, and consequently the old time pile of stripped and mashed gears that formerly "adorned" the average repair shop is now no more.

Though the amount of money invested in the heat treating and testing equipment in the large automobile factories is quite large, the outlay has not worked to increase the cost of motor cars to the public. On the other hand, it has served to reduce the price in many instances, and to incorporate into the machines a factor of safety that is not computable in dollars and cents.

NATIONAL SHOWS PLANS MADE.

Full Details for the Motor Car Exhibitions At New York City and Chicago Announced.

The National Automobile Chamber of Commerce has sent out preliminary notices of the seventh annual national automobile shows which are to be held under the auspices of that organization next January in New York and Chicago.

The New York show will be held in the Grand Central Palace during the week of Jan. 6 to 13, and the Chicago show in the Coliseum and First Regiment armory during the week of Jan. 27 to Feb. 3. The space for exhibitors in both shows has been largely taken and the exhibitions will eclipse all previous ones in both quantity and quality of machines shown, as well as the representative showing of accessories.

The automobile section at the New York show will be in two departments as usual, including the first and second floors of the Grand Central Palace, as well as wall spaces on the third and fourth floors, and such other space as is necessary to supply the applicants for space in this section. Section C and as much of section D as is required will be devoted to the use of accessory manufacturers.

The automobile section will include all of the main floors in both the Coliseum and Armory at Chicago and the entire gallery and second floor of the Annex at the Coliseum will be used for exhibition by the accessory and manufacturers.

The prices for space at the New York show, including equipment, are as follows: Section A, \$1.50 per square foot; section B and C, \$1.35 per square foot; section D, \$1.10 a square foot. For the Chicago show: Coliseum and Armory main floor centre, \$1.25 a square foot; Coliseum annex basement, 75 cents, and all other space 90 cents a square foot.

HACKETT CAR AT \$888.

The successor to the Argo car, the new Hackett, manufactured by the Hackett Motor Car Company, formerly the Argo Motor Car Company, of Jackson, Mich., has a number of distinctive features in addition to a novel straight line body effect.

There are three models listed, all built on the same chassis of 112-inch wheelbase. The three-passenger roadster, or five-passenger touring models, sell at \$888, and the cabriolet at \$1000. A winter top that can be installed on the touring car is also listed, the price being \$110 extra.

The power plant is a 37-horsepower, detachable L head motor, fitted with a Golden-Belknap & Swartz clutch, Grant Lees gear box, and Disco motor generator for lighting and starting. The ignition system is a Remy coil and distributor and a Stewart vacuum system is part of the equipment.

Walker Weiss axles, with semi-elliptic springs in front and three-quarter elliptic in the rear are employed. The standard tire equipment is Ajax, 32x3½.

The finish is another feature of the new Hackett, Packard blue bodies, with ivory white wheels and French pleated upholstery giving the car a very snappy appearance.

"STOP THIEF."

The Automobile Club of Lincoln, Neb., has adopted a novel, but effective method of discouraging automobile thieves and also of bringing them to justice. When the police and sheriffs seemed baffled by the numerous thefts the club organized a vigilance committee of about 200 members to work with or independently of the police in apprehending the auto thieves.

As soon as the theft of a car has been reported to the police, the president of the club, or the secretary, a call is sent to all the members of the committee, who stand ready to respond night or day. The members drive to the nearest police station where they pick up a member of the police force and are assigned to one of the main roads leading out of the city. In this way a radius of about 25 miles is covered and incidentally the surrounding cities and towns are notified to be on the lookout for a certain car. The Lincoln Telephone and Telegraph Company also co-operates in the system, giving wide radius to the information that a car has been stolen.

The members at the outposts of the city stop all cars coming in and ask the drivers if they have passed the stolen car. In case they have the machine is

tracked down immediately. In the first 10 days that the system was in operation six automobile thieves were apprehended and four joy riders were brought to justice.

Automobile thefts have become a rarity in Lincoln since the thieves have come to realize that opportunities of getting away with a machine are extremely slight.

ROSS 1917 MODELS.

While the Ross 1917 models will show few, if any mechanical changes, they will embody the latest designs in finish and lines. The car is given a racy appearance by a pronounced rake in the steering column and a double cowl effect is worked out at the back of the front seat. The hood joins the cowl with graceful lines and without a break and the radiator shell meets the hood lines with a pleasing effect.

The chassis has a 130-inch wheelbase. There is a tapered frame of deep sections with sturdy drive members and long, wide springs. The motor is a standard eight-cylinder Herschell-Spillman and together with the motor, clutch and gear-set form the power unit. The drive shaft is enclosed in the torsion tube. The rear axle is of the floating type, with semi-elliptical springs, which are also used on front. It is equipped with a Stewart vacuum system and a two-unit starting and lighting outfit.

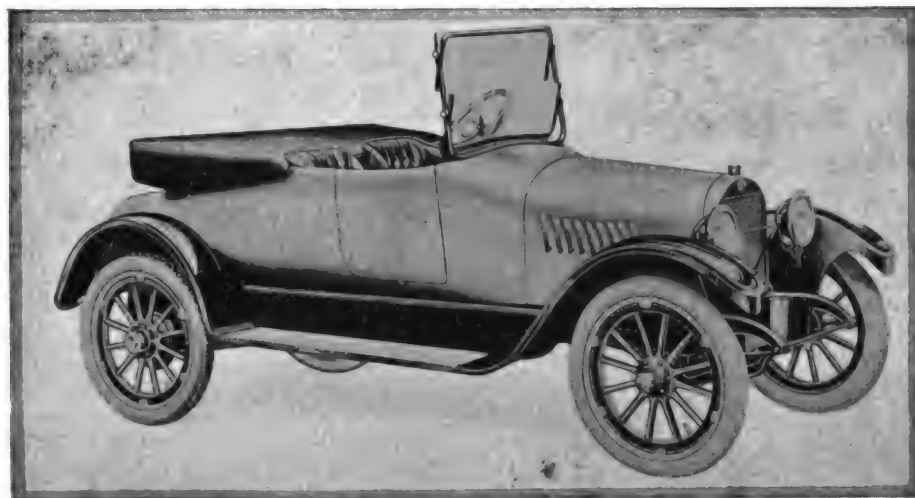
BRISCOE CAR MAKES RECORD.

A Briscoe car driven by Benjamin Hammond, manager of the Oakland (Cal.) branch of the KisselKar company, distributors of the Briscoe car on the Pacific coast, made a record run from Key Route Inn to the peak at the summit of Mt. Diablo in 61 minutes and 50 seconds, clipping nearly five minutes off the best previous record. The distance over the route is 30 miles, all up grade, with many sharp and dangerous turns.



THE CAPITOL TO CAPITOL HUPMOBILE.

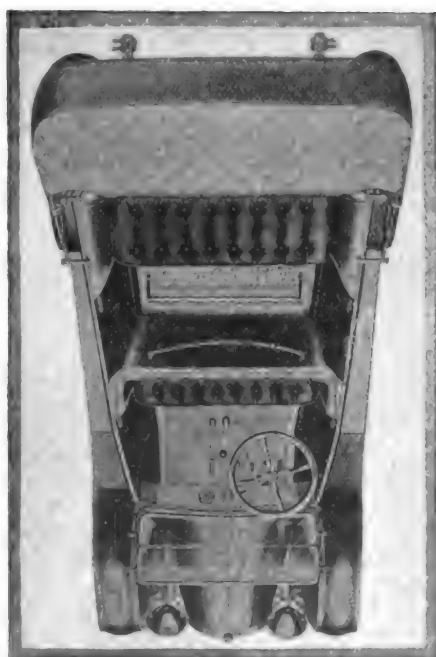
President J. Walter Drake of the Hupp Company Sent Out the Car to Visit Every Capitol in the Country in the Interests of Good Roads, a Journey of 20,000 Miles. It is Now En Route and in the First 18 Days After Leaving Washington, on Aug. 28 Has Visited 16 State Capitols.



Roadster Converted Into a Two-Passenger Runabout.

HAVING made certain before undertaking production that the design of the original Dixie Flyer was right, the makers of the car, the Dixie Motor Car Company, Louisville, Ky., a subsidiary of the Kentucky Wagon Manufacturing Company, have found it unnecessary to make any perceptible alteration in the basic structural or mechanical features in designing the 1917 model. Many changes are apparent, but with one outstanding exception, all are in the nature of refinements of details.

The exception is the location of the battery. In the 1916 chassis this component was in the conventional position under the floor boards, close to the supporting arms of the motor, where it was subjected to vibration and heat. In the 1917 chassis the battery is on the left hand side of the main frame, well forward and below the radiator, where it is free from heat and vibration; merely raising the hood exposes every connection.



Interior of the Five-Passenger Touring Car.

The Lycoming motor, a $3\frac{1}{4}$ by five, four-cylinder block casting, L head design, is retained. It is rated by the S. A. E. formula at 16.9 horsepower, but is said by the maker to develop 29 at 1900 revolutions per minute. The cylinder head is a separate casting, allowing for large valves and ready access to the valves and cylinders. The water jacket is cast integral with the cylinder block and the water inlet is at the bottom of the casting, on the side opposite the valves.

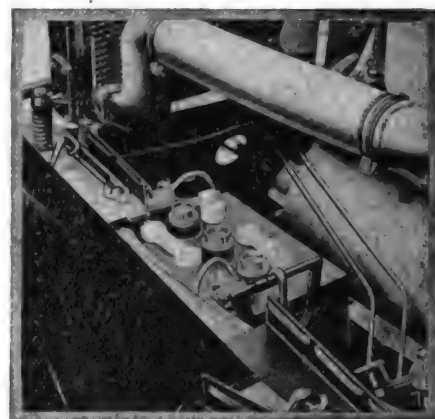
The crankshaft, a drop forging, is carried on two bearings of liberal size. The bearings are of split die cast white metal and adjustable by means of brass shims. The one-inch camshaft is supported on three bearings and is driven by helical timing gears, which are marked for meshing, to make retiming a simple matter.

In the lubrication system a plunger pump, driven by an eccentric on a camshaft, circulates the oil, which is carried by leads to supply the crankshaft and the troughs beneath the connecting rod throws. The scoops at the end of each rod dip into the oil reservoir, which is the bottom half of the crank case, and holds five quarts of lubricant. The design of the oil pan insures an equal depth of dip regardless of the level of traction.

In the thermo-syphon cooling system the lowest level of the water is placed above the cylinder jackets by mounting the radiator on the frame instead of between the frame members, which allows circulation to commence simultaneously with the starting of the motor. Additional efficiency is obtained by having each cylinder barrel independent of its neighbor, which permits free circulation all around and between the cylinder walls. Extra large water passages are provided around the

A Refined Dixie

In 1917 Model Location of Now Entirely Removed from Accessible — Several Other

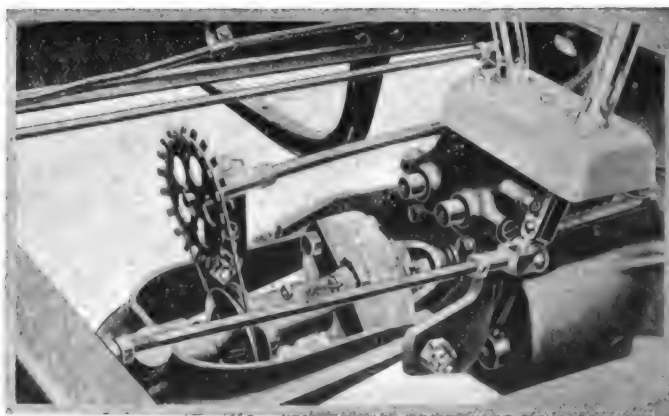


New Location of the Willard Battery.

valves, and the inlet and outlet pipes are also extra large.

The gasoline system includes a Carter carburetor, Stewart vacuum feed and a cylindrical tank on the rear of the chassis. The tank has an arrangement for always keeping from one to three gallons in reserve and is provided with an automatic signal to notify the driver when the reserve is reached.

The electrical system comprises a Dyneto two-unit starting and lighting installation and a Connecticut system, for ignition. A Willard battery has been adapted. The starting motor is driven



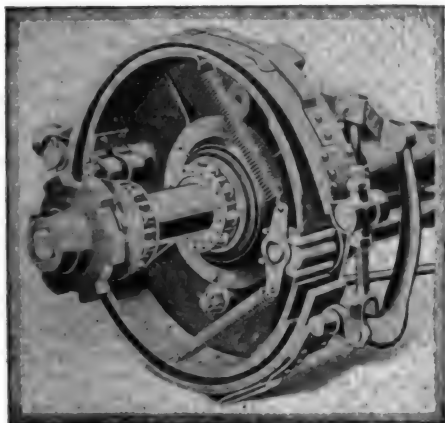
Flexible Universal and Speedometer Mounting.

from the flywheel by means of the Bendix drive system through the flywheel ring gear. On the dash of each car is a wiring diagram so that uninitiated owners may have a ready illustration of the electrical connections. The generator cuts in at 10 miles per hour.

The clutch is a pressed steel cone with leather facing and with six compensating spring plungers under the facing to secure easy engagement. The drive is through a Grant-Lees standard gearbox,

Flyer Now Offered.

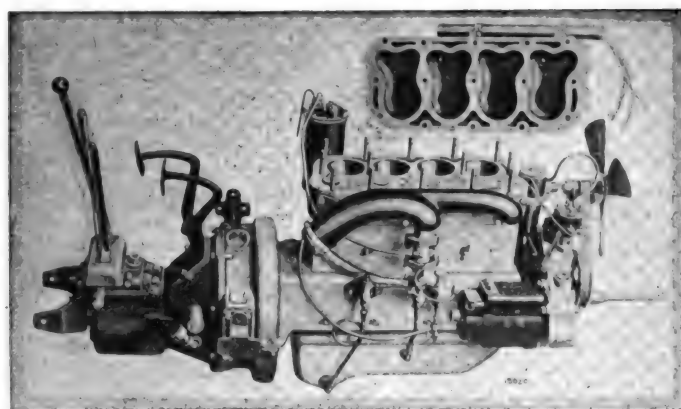
**Battery Has Been Changed—
Motor Vibration and More
Refinements Are Incorporated**



Brake and Bearing Assembly of Rear Wheel.

and straight drive is always insured through the use of underslung springs and inclining the motor in the chassis. The main shaft has four splines and is carried on a double row of S. K. F. bearings. A roller bearing is placed between the stem gear and the main spline shaft.

The rear axle has chrome nickel steel shafts and gears and is full floating. Final drive is spiral bevel mounted on high duty roller bearings with end thrust bearings on either side. A notable feature is that all gears and bearings are adjustable, to permit a continuous good

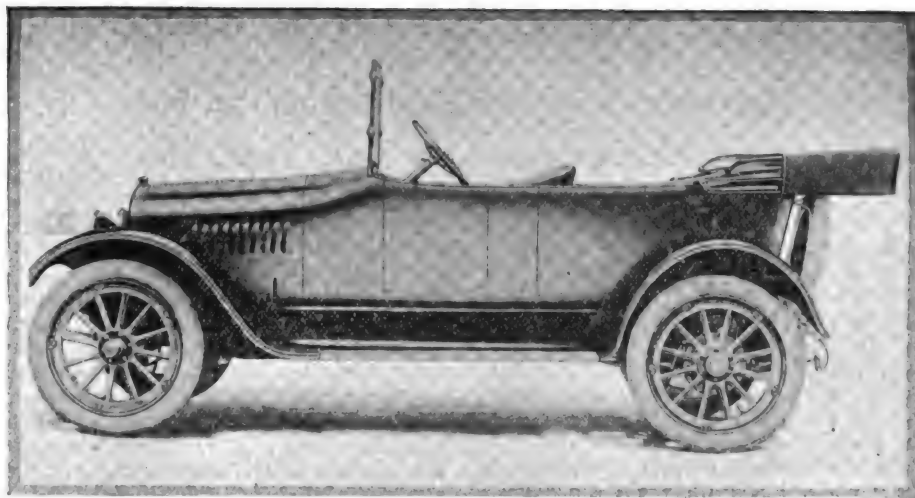


Unit Power Plant with Lycoming Motor.

mesh and reduction of noise due to looseness through wear.

The frame is a straight pressed steel channel with four cross members and a conspicuous absence of "cluttering" castings. Strength, combined with minimum weight, is obtained by use of steel and drop forgings in place of malleable metal.

The wheelbase is 112 inches. Steering is irreversible. The wheels, which are artillery type, are equipped with 32 by 3½-



Five-Passenger Touring Car, Price \$795.

inch tires on demountable rims.

The Dixie Flyer line for 1917 includes two body types, a five-passenger touring and a four-passenger roadster, the last mentioned being of the cloverleaf design. Straight lines predominate, ranging from the radiator to the cowl, with a slight curve in the side rail line. The roadster has about the same lines, has unusually low centre of gravity and is provided with a sloping windshield. The forward compartment is fitted with two individual seats, while the seat in the rear will comfortably accommodate two adult persons. An auxiliary apron or cover of Packer cloth is provided to fasten by glove fasteners to the bows when top is lowered, completely concealing the rear compartment and converting the roadster into a two-seated runabout. One-man top of Packer cloth and quick detachable side curtains are also part of the standard equipment.

The standard finish is Brewster green with high crowned fenders in black enamel. The price of the 1917 Dixie Flyer touring car and the roadster is \$795, which includes the usual complete equipment.

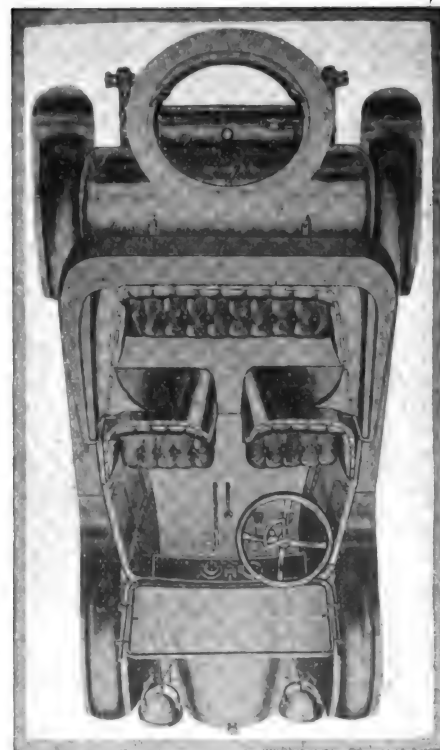
A notable feature of the new model is its riding qualities, which are due partly to the extra long self-lubricating three-quarter scroll elliptic springs at the rear. These are provided with heavy rebound straps to limit their action. Front springs are semi-elliptic. Both sets are swiveled at end.

OVER THE LINCOLN HIGHWAY.

S. B. Stevens, chairman of the Motor Reserve Division of the American Defense Society, who drove a Marmon 34 from New York City to San Francisco over the Lincoln Highway in five days, 18 hours and 30 minutes, had an opportunity to observe road conditions over

that route and, contrary to the general conception of them, says that they are anything but good.

"The term 'Lincoln Highway' conveys to the minds of the majority of people a broad, smooth, finished road, over which an automobile may be driven at high speed," says Mr. Stevens. "As a matter of fact, the Lincoln Highway is more of a route than a road. The Lincoln Highway movement is comparatively young, and as it takes years to build a good road, it is no wonder that the ocean to ocean route across the middle of the United States is still in the embryonic stage of development. 'I never thought that any machine could be driven at such a rapid rate for such a long distance with the unfavorable conditions that we had to encounter and I was surprised the way in which the Marmon 34 stood up under the strain.'"



Interior of the Four-Passenger Roadster.

METZ REDUCES 1917 PRICES.

Announces Model for Next Season that Has Several Refinements Over Last Year's Car.

DESPITE that the cost of labor and raw materials has been advanced quite considerably during the past year, the Metz company announces that its gearless Metz touring cars and roadster for 1917 will be reduced \$55 in selling price, they being offered at \$545 each. Furthermore, features have been added that increase the value of the car over the previous models by \$200.

No radical changes have been made in the model, though the body lines have been improved and no efforts have been spared to make the mechanism as nearly perfect as possible. The equipment is complete and very high in standard, so much so that Sales Manager R. A. Pickens feels that there is not another machine made, selling within \$200 of the Metz price, that provides as much dollar-for-dollar car as does the 1917 Metz.

Improvements in Chassis.

Chassis changes have been few, for since the Metz won the first three places in the Glidden Tour, demonstrating the sturdiness, reliability and economy of the gearless transmission construction, President Charles H. Metz has considered it unnecessary to add materially to the mechanical design. The reciprocating parts of the motor have been lightened, however, and are better balanced. A new ventilating hood, with nickel plated clamps has been provided, and the metal covered windshield board is now completely enameled. The steering column brackets have been improved and an electric dash light has been placed on the instrument board. Pockets have been provided in the tonneau doors, after the fashion of the higher priced models.

The standard wheel color is vermilion, with option of white or royal blue, and either wire or artillery wheels may be had. The front guards curve gracefully over the wheels, blending into the body sides by means of a steel apron, and protecting the occupants from wheel and

road splash. It adds much to the appearance of the car, lending an air of a high priced sport motor.

An improved rigid chassis construction has been provided, together with a newly designed front axle, and the thrust washers have been hardened. Mounted on the top of the axle is a sturdy five-leaf spring fully capable of supporting a five-passenger load. A new design of muffler, placed at the rear of the chassis, makes for silent operation.

Everything on the Metz cars, excepting the Goodrich tires and the Gray and Davis starting and lighting system, is made in the Metz factories at Waltham and under the personal supervision of President Metz. The 1917 cars are of the same design as the one Mr. Metz made for himself; in fact, this is the Metz method, the company's president designing improvements for his own machine and then incorporating them in the cars sold to the public.

The standard chassis contains three units, an improved $3\frac{1}{2}$ "x4" motor of Metz manufacture, the Metz gearless transmission and the rear axle and differential assembly. The motor is a four-cylinder, water cooled, 25 horsepower block casting, in which the valves are interchangeable and mechanically operated, and are located on the right hand side of the motor. The pistons are ground and fitted with four rings and the camshaft, enclosed within the crank case, is positively lubricated. The crankshaft is of specially heat treated steel and is supported on three main bearings of liberal dimensions. The crank case's upper half is carried on two steel channel sections bolted to the main frame. The bottom section is an oil well and is easily removable for inspection, etc.

Carburetion is by an A. W. T., float feed, automatically regulated instrument, the gasoline being fed by gravity from a 10-gallon tank built into the cowl. The

ignition system is a Dixie high-tension type, one that is considered very efficient. Lubrication is by the constant level splash oiling system, in which more oil than is absolutely needed for operation is supplied at all times, the overflow level allowing the surplus to return to the reservoir.

Starting and lighting is by a Gray & Davis two-unit system, the generator positively supplying the batteries with sufficient current to allow for frequent starting and ample reserve for brilliant lighting.

Gearless Transmission Retained.

The Metz gearless transmission, of course, is retained in the 1917 model. It has given universal satisfaction, and is one of the chief outstanding features of the Metz car. In this system there is a special alloy driving plate contacting against a fibre ring driven wheel, providing seven speeds forward and one reverse. The system is described generally as an absolutely flexible transmission in which there are no gear or clutch troubles.

The braking system includes a service and an emergency set, one being external contracting and the other internal expanding, both acting on ample drums and being powerful.

The springs are full elliptic, front and rear, with extra shock absorbers, which, with the luxuriousness of the upholstery and the low centre of gravity, coupled with the even flow of power through the gearless transmission, makes the Metz car distinctive for its riding qualities.

The wheelbase is 108 inches and tread the standard 56 inches. Ready for the road the car weighs 1950 pounds.

The wheels are clincher, artillery type, 32 inches, using $3\frac{1}{2}$ -inch tires. Demountable wheel equipment will be supplied upon specification for \$15 extra net.

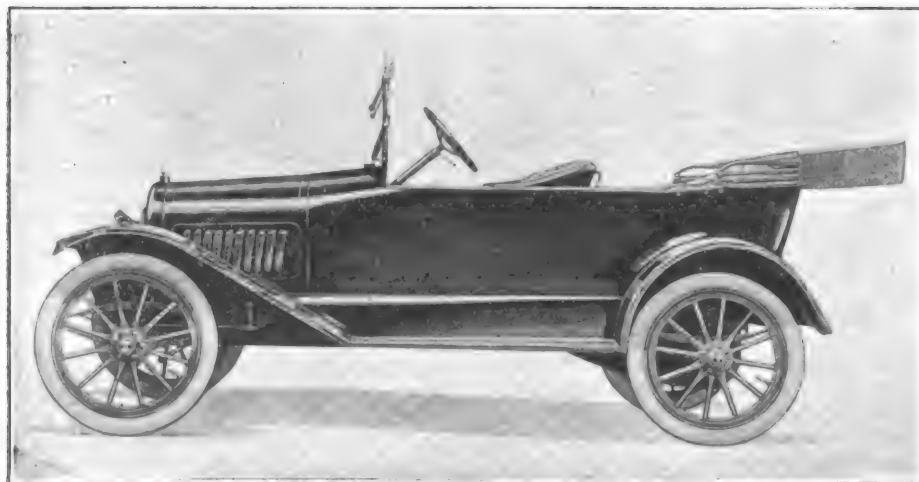
Body Lines Much Improved.

The body lines, as mentioned before, have been improved, they having the popular streamline effect. The windshield is a built in, rain vision type, adjustable for rain and ventilation and especially designed for the Metz car. The top is an instant one-man design, arranged so that when in use it fits down over the windshield frame in a tight joint. The car is also provided with close-fitting storm curtains and cover slip.

The standard equipment includes an A. W. T. speedometer, automatic signal horn, jack, tire irons, tools, electric light, special tool box in the rear of the chassis, license bracket and pockets in the tonneau doors.

FREE RIDE TO THEATRES.

The Messrs. Shubert, proprietors of a number of large New York theatres, have inaugurated a free motor bus service for the convenience of their patrons who live in Harlem and thereabouts. Anyone having a ticket for anyone of the Shubert productions will be carried free to the entrance of the theatre.



The 1917 Metz Touring Car, Selling for \$545.

Kerosene Versus Gasoline in Standard Automobile Engines.

Part II—A Discussion Presented Before the Members of the Society of Automobile Engineers.

By CHARLES E. LUCKE,

Professor of Mechanical Engineering, Columbia University.

EVEN if a form of vaporizing heater suitable from the vaporizing standpoint be selected, size, a matter of great importance, will depend on degree to which that form conforms to requirements of the heat transmission laws and at the same time to the laws of loss of pressure through the heater. Loss of pressure means reduced density of charge and power output, and from this standpoint any passage that is excessively long, tortuous or too much baffled is objectionable, especially if the full charge of air must pass through it, as it should for best low temperature vaporizing. Heat transmission rates in British thermal units per hour per square foot per degree mean temperature difference are by no means constant when heat is transmitted from one gas to another through metal plates, and the mean temperature difference itself is subject to even more variation with conditions of heater design and location, for a given engine. These two factors are prime variables in the size of a given heater, and the conditions that result in the maximum values for each and hence the minimum value for the heating surface must be clearly understood and recognized in selecting heater forms, their locations and connections.

Two conditions are to be observed in securing the highest value of the mean temperature difference; first, the condition on the mixture side, and, second, that on the exhaust side. On the mixture side the temperature must be kept as low as possible, and this is accomplished by using the full amount of mixed air in the vaporizer so as to secure dryness at the lowest temperature. On the exhaust side the gases are hottest at the exhaust valve port outlet, so that the heater should be as close to this point as possible. It is well known that visible flame, especially the red or yellow kind, rather than the blue, has a heat radiating power, and that radiant heat will pass from such a glowing point through intervening gases into metal walls practically without resistance, and at rates enormously higher than it can pass from a hot gas current through the same walls to a cooler gas current.

The exhaust gases from these engines have radiating power, and radiant heat can be obtained from them by any walls placed in direct line. For this reason not only

ABSTRACT.

In the preceding issue the author outlines the factors leading up to the present high cost of automobile fuel, states that the introduction of new distillation processes will not solve the problem, but that the development of kerosene utilizing appliances will produce results satisfactory to everybody.

The paper proceeds to show why kerosene cannot be used on the present gasoline cars. The adaptation of the gasoline automobile engine to the use of heavier fuels than will vaporize without the use of heat is entirely a problem of heating and heaters.

The author reviews at length the principles embodied and the construction of the heated vaporizers or vaporizing heaters now used in stationary and traction kerosene engines and in alcohol engines, giving illustrations of a number of such devices.

In this chapter, the last, the author describes a form of vaporizer embodying such principles which, he states, has had successful trials (both block and road) in automobile service. A semi-automatic starting burner to accompany the vaporizer is also described, both as regards its construction and operation.

should the heater be close to the exhaust ports, but it should also lie so directly in front of them as to receive all the radiant heat in these gases before it is intercepted by any header or pipe connection. A heater conforming to these best conditions would, for a multi-cylinder engine, be of elongated form and be placed directly across the exhaust outlets within the exhaust header. If not of this form, it should conform as nearly as possible to the conditions of closeness, although if the radiant heat be lost, more surface must be provided.

High Gas Velocities and Least Loss of Pressure.

The unit heat transmission rate from hot gases to cooler mixtures, follows the law first suggested by Jordan and now established and known as the mass flow law. According to this, whenever the controlling resistance to heat flow lies on the gas side of a wall, the heat that will pass or be taken up by the gas is directly proportional to the weight of gas passing per minute. Therefore, as the amount of heat is the product of the specific heat, the temperature rise and the weight, it follows that in such a case the final temperature will remain constant, no matter how the flow may vary. According to this the mixture should at all times be given a high velocity if the high rate heat absorption is to be promoted, by using small passages for the mixture. This, of course, runs counter to the requirement for least drop in pressure in ordinary passages, because high velocity produces pressure loss by friction. The best result is therefore to be obtained by a judicious balance between high mixture velocity on the one hand and excessive loss of pressure on the other, so that the heater size may be a minimum, consistent with least loss of engine power.

In any case the form of passage that permits of the use of the greatest velocities with least loss of pressure is most suitable, that is, the passage should be as frictionless as possible and no abrupt bends or eddy currents are permissible. Increasing mixture velocities will not necessarily increase the rate of heat transmission, nor will the final temperature be constant unless, according to the mass flow law, the controlling resistance be on the mixture side of the heater walls. Should

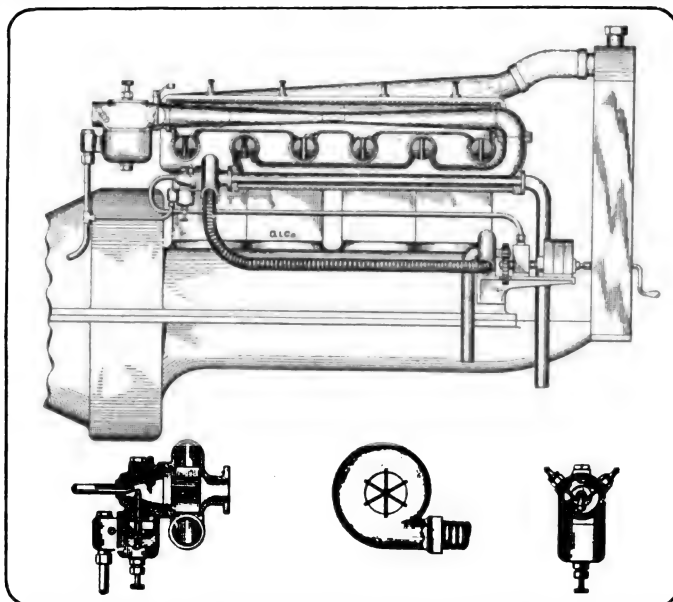


Fig. 15—The Good Venturi Mixture Vaporizer and Starting Burner.

it be on the other, or exhaust side, the rate of heat transmission will depend on the rate with which the tube metal can get the heat. This also follows the mass flow law with one exception. The exception element is the radiant exhaust gas heat that enters the tube at a rate so much higher as to tend to keep the thermal resistance on the mixture side. Heated location directly in line with exhaust valve discharges therefore tends to establish not only the high rate of heat transmission desired for small heater size, but also to keep the thermal resistance on the mixture side of the wall, which in turn is the condition for automatic constancy of mixture temperature.

To still further promote the same end the exhaust gases must move past the heater walls with the maximum possible velocity. This is promoted by so locating the heater walls as to make the exhaust gases impinge on it with their high exit velocity, and by keeping the size of the exhaust passage along the heater walls as small as is consistent with non-development of excessive back pressure. By making the heater the restricted exhaust passage, instead of the muffler, the vaporizer will itself act as a muffler, and produce the desired heat transmission conditions with no more back pressure than is now normal. The heat absorbed by the mixture has been taken from the exhaust, reducing the volume of the latter correspondingly, and hence the back pressure beyond the heater in exhaust pipes of normal size. It must not be understood by this that mufflers can be eliminated necessarily, but rather that they can be reduced in size or resistance, in proportion as the heater shares the duty.

With due regard to these conditions for high rate heat transmission, the heater will be small and the mixture temperature as constant as they are perfectly executed. The result will be most nearly perfect when both mixture velocity and exhaust velocity are high, the latter higher than the former; when the exhausts impinge most directly and most vigorously on the heater walls; and when these walls receive the maximum radiant heat from the first escaping luminous exhaust gases.

The form of the exhaust valve ports may contribute to, or oppose these results; the former when they allow the gases to come straight out through the shortest possible passage; the latter when, as in block castings, the gases must make a double turn in a water cooled pocket, which cuts off all the radiant heat and a good deal of the hot gas heat. Similarly, on the intake, short, straight inlet ports will chill the warm mixture least; crooked, long block casting pockets, cooled by water, will chill the mixture most. There is little justification for careful design of heaters if inlet valve pockets are left to rob the mixture of its heat, obtained at so much trouble in the heater. Of course, in any case an operative condition is obtainable, but is more easily obtained with smaller and lighter equipment if the engine connections are favorable.

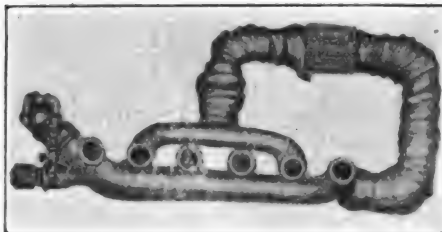


Fig. 16—Experimental Good Vaporizer with Dryness Sight Glass.

Vaporizer Embodying Correct Principles.

It is possible to design heaters and connections in a great variety of forms, and still conform to the principles developed as desirable and good. No doubt many do so conform, but to make the

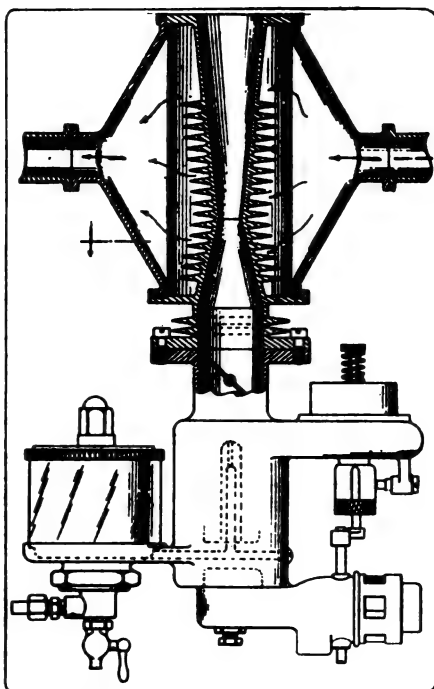


Fig. 17—Ribbed Type Short Good Venturi Vaporizer with Carburetor and Throttle.

situation clear and convincing, one form, recently developed by Mr. John Good of Brooklyn, N. Y., will be described, because this seems peculiarly adapted to the purpose, is most familiar to the writer and has reached the stage of having had successful road trials on a Ford

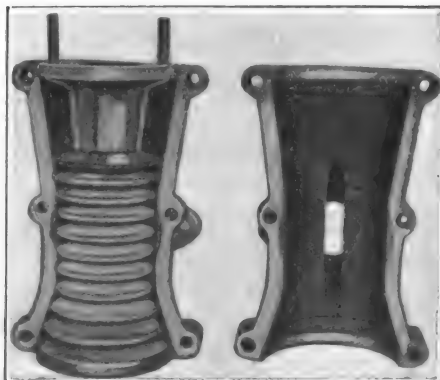


Fig. 18—Good Ribbed Venturi with Exhaust Casing Open.

car, after long and systematic study on the test block in competition with many others of great variety. This is presented as one good concrete example of the principles discussed, and entirely without prejudice to others known to the writer.

The Good vaporizer is in the form of a Venturi tube of narrow angle, made of thin steel tubing, which weighs little, is strong and cleanable on both sides. Its length is made to conform to the exhaust header in which it is mounted, so as to be close to and preferably directly in front of the exhausts. This form of passage, by the well known laws of such a tube, produces a high velocity at the throat with a correspondingly considerable pressure depression, and with the least possible overall loss of pressure between the ends. The high critical velocity promotes good heat transmission conditions; the throat pressure depression promotes quick vaporization by reducing the total mixture pressure and the partial vapor pressure; and pressure recovery is produced by the enlarging cone where velocity is converted back into pressure with practically no loss.

In a series of Venturi tubes, recently tested by Prof. E. D. Thurston, Jr., of Columbia university, with throats ranging in diameter from one-quarter to one inch, and having angles of 11 degrees, the overall loss in pressure for the one-quarter inch diameter throat was three inches of water at 10,200 feet per minute throat velocity, and 1½ inches of water at 6000 feet per minute; while in the one-inch diameter throat the loss was about 50 per cent. more. This is practically nothing and much higher velocities are quite feasible. The high velocities, characteristic of Venturi throats, are above those analyzed by Osborne Reynolds and characterized by "turbulent flow;" as a result the mixing of the air and vapor is perfect, and far better than can be obtained by baffles, which always introduce friction and loss of pressure.

This Venturi heated vaporizer is shown in place in the exhaust header, Fig. 15, with an ordinary carburetor feeding it with a wet, rainy mixture. The warm, dry mixture discharges around the end to the intake header just below, this engine having both valves on one side. The connections were such that it could not be placed in the most favorable position, directly in front of the exhaust outlets. An early experimental Venturi vaporizer is shown with two headers, Fig. 16, equipped for studying dryness by the wire screened glass sight tube, and with lagging to save loss of heat in the long bends inserted to get a good position for the sight glass. Another and shorter form, Fig. 17, has external ribs intended to be placed vertically at the end of the exhaust header, the mixture carburetor being below and the throttle valve located between carburetor and vaporizer to get the full advantage for vaporization of all pressure depressions, due to a partly closed throttle. An external view of this is shown in Fig. 18.

Semi-Automatic Starting Burner.

No vaporizer for automobile use can of itself be regarded as furnishing a solution of the kerosene problem, because

starting heat is necessary, and this must be derived from the burning of kerosene in a suitable burner. The old suggestions and practises of starting on gasoline, or, of using electric heaters, are not satisfactory, the first because it is a nuisance, and the second because of the large storage battery capacity and the high rate of electrical discharge required. A good semi-automatic starting burner also has been developed by Mr. Good, and has proved to be thoroughly reliable. This burner, together with an independent starting heater, is shown in Fig. 15. The burner is located at the end of the intake header, and its flame passes along the inside of a small light steel tube, inside and close to the bottom of the header. The burner flame raises this interior tube to a red heat in about 15 seconds, the products of combustion passing out the end and downward to a point below the engine. No flame ever appears at the outlet. The good quality of combustion and the shortness and intensity of the flame are indicated by an analysis of the products, which showed only two per cent. of free oxygen and zero carbon monoxide.

The construction of the burner is shown by lower right hand section, where the vertical oil nozzle, fed from a float chamber, is crossed horizontally by a jet of air at about one pound pressure, produced by the smallest size of Wing positive blower, shown beside the magneto. The crossing air jet makes a fine spray of oil, which moves past the spark points, where it is ignited automatically by the magneto geared to the Wing blower. The spark points are arranged as shown in the lower right hand section (Fig. 15) with the terminals bent up and toward each other. This causes the oil drops that collect to fall away to the lower loops by gravity, leaving the tips free to spark; before this was done the ignition was bad, but afterward it never failed in over a year. The spray flame escapes through an enlarged air chamber, supplying air around the spray to support the combustion, which becomes vigorous only beyond the radial guide vanes at the exit from the burner or at the entrance to the heating tube, tightly fastened to it. The air supporting combustion is supplied through a flexible metallic tube from a small vacuum cleaner fan, geared to the Wing blower and the magneto. One turn of the shaft automatically starts the burner and it continues to burn as long as the motion is applied, stopping automatically when the motion stops.

In another form of this burner, one larger positive blower is made to take the place of the fan and small blower; this is shown in Fig. 19. Here the main air is divided, one part passing through a small Venturi tube, meeting oil at the throat, where it is sprayed by the high velocity. The main air stream is bypassed and led around the oil jet in an annular layer surrounding the oil spray to support combustion. The spark plug terminals are bent toward the high velocity jet so the collected oil drops will be driven back and away, independently of gravity.

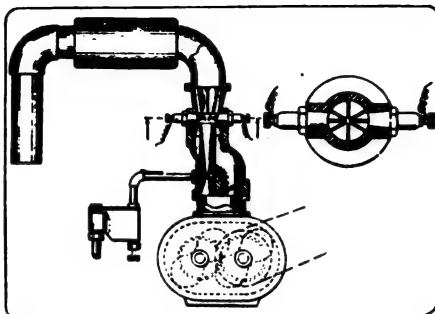


Fig. 19—Good Single Blower Type Starting Burner with Venturi Sprayer.

The parts of one of these burners of the first form are shown externally in Fig. 20. As assembled, the magneto, Wing blower and fan, geared together for operation by a hand crank are shown

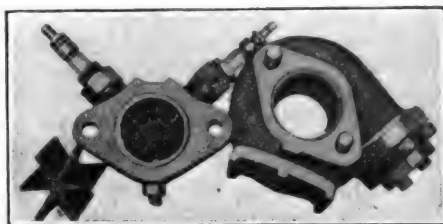


Fig. 20—Parts of Good Double Blower Atomizer Spray of Starting Burner.

in Fig. 21, which has an inch scale, showing that its overall length is about seven inches and its height is six inches. A complete burner outfit is shown in Fig. 22, where the burner is attached to a

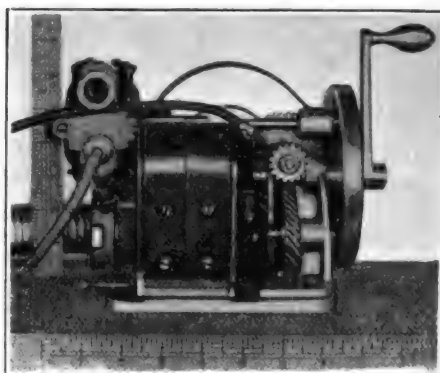


Fig. 21—Assembly of Blower, Magneto and Fan of Good Atomizer Spray Type of Starting Burner.

heating jacket welded around a Ford inlet header, so that the starting heat is applied to it externally, as compared with the internal arrangement of Fig. 15.

This equipment, applied to an engine on the test block or to a car on the road,

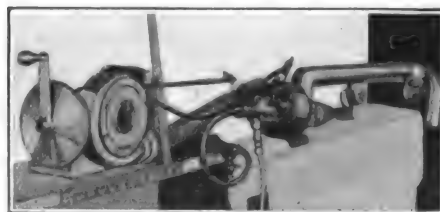
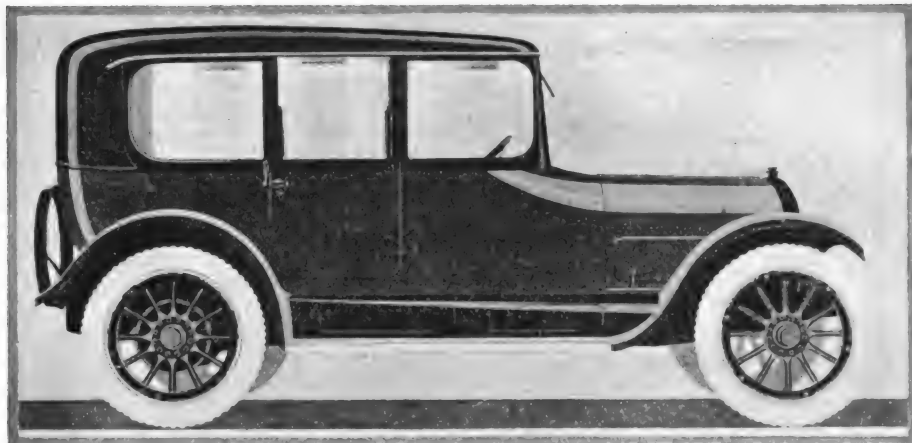


Fig. 22—Working Relation of Good Starting Burner, Burner Auxiliaries and Flame Jacketed Ford Intake Header.

works with satisfaction so far as operation is concerned. There is no trouble more than with gasoline except a slight starting lag, measured in seconds, due to the necessity for letting the starting burner develop the necessary starting heat. The engine idles and accelerates just as well as with gasoline; there is no smoke or carbon accumulation, and the operator would never know he was using kerosene, and is more independent of cold weather than with gasoline as now used. With hand cranking the burner gear may be rotated by the starting handle a few times before engaging the engine shaft; then pressing in the handle to pick up the engine, it will start promptly. It is desirable, although not necessary, that the burner be continued in operation a few minutes after the engine is started, and until the interior and the exhaust connections warm up. This will prevent entirely the temporary accumulation of kerosene in the cylinder while it is cold and obviate completely smoke and lubrication interference. It is not absolutely necessary, as such accumulations are slight and disappear quickly as the engine operates, and in no case do they prevent its running.

With a self-starting gear the whole engine and burner can be started simultaneously, the first oil passing through without igniting and some, of course, accumulating until the burner tube heats up, which it does very quickly, and then the engine picks up and evaporates the oil accumulation. The whole time required and results are substantially the same as are now common with heavy gasoline in cold weather. Even this condition can, however, be eliminated entirely by a little electric fan motor on the burner gear, started by a button a moment before the main engine motor starting button is operated. With this arrangement no kerosene can accumulate, the engine should pick up instantly and the operator can keep the burner in operation as long as conditions warrant.

It is hoped that by this presentation of principles on which good and satisfactory kerosene equipment can be designed, illustrated by one concrete example, the movement toward the production and use of kerosene automobiles will be undertaken immediately on a scale sufficiently large to affect the price of fuel within the next year. Commercial results can be obtained most quickly and with the least development and experimental expense, by the adoption of the sort of equipment described, but such adoption is not an absolute necessity. A hundred different sorts of equipment could undoubtedly be designed, all conforming to correct principles, but only with the expenditure of more experimental and development funds and with corresponding delay in time. Finally, it is equally possible to proceed along quite different lines from those laid down as the most desirable and immediately available, and still get good results. The public in general and the automobile and the oil industries must have something that will use kerosene and be so acceptable as to secure use and adoption on a big scale.



Model 88-Four Touring Sedan at \$1950.

IT IS generally conceded that the designers of the Willys-Overland Company of Toledo, O., have surpassed former practise in producing the new seven-passenger four-cylinder, Willys-Knight model 88-4. It is the best appearing and most comfortable model ever turned out of the Overland plant; there are some who claim it is the best car in its class ever produced in America. It is a distinctively custom built appearing vehicle.

This model is the first seven-passenger car with a Willys-Knight motor; it has all the most approved fittings and body lines. The body is the latest pure streamline conception, with the fashionable double cowl, making the top of the front seat blend into the top line of the body. In appearance it is very long and low and of distinctive beauty. The wheelbase is 121 inches.

There are three body types in the 88-4 series, a touring car selling for \$1285 and a touring sedan and a limousine, both priced at \$1950. The finish of the bodies, a rich French blue, is set off to pleasing advantage by black fenders and trimmings. The wheels of battleship gray heighten the appearance of quality, as do the nickel and polished aluminum fittings. The sloping, built-in windshield, conforms to the curve of the cowl and further accentuates the distinctive appearance of the car.

Many changes have been made in the chassis details. The 40 horsepower Willys-Knight motor is like that used in the 1916 series. It is of the sleeve valve type, $4\frac{1}{8}$ -inch bore and $4\frac{1}{2}$ -inch stroke,

in which poppet valves are done away with. Two cylindrically shaped sleeves are operated silently and evenly up and down in a film of oil by means of connecting rods, ports in the sleeves registering with each other to form inlets and outlets for the gases. The only change made in the motor is that Connecticut battery ignition has been adapted in place of the former magneto system.

One of the outstanding features of the engine is the lubrication system. In the Willys-Knight motor the flow of oil to the bearings is automatically regulated by the movement of the throttle and is therefore proportioned to the amount of work the motor is doing rather than merely to its speed. By this means practically no surplus oil is deposited in the combustion chamber to burn and form carbon, and waste through the exhaust is overcome.

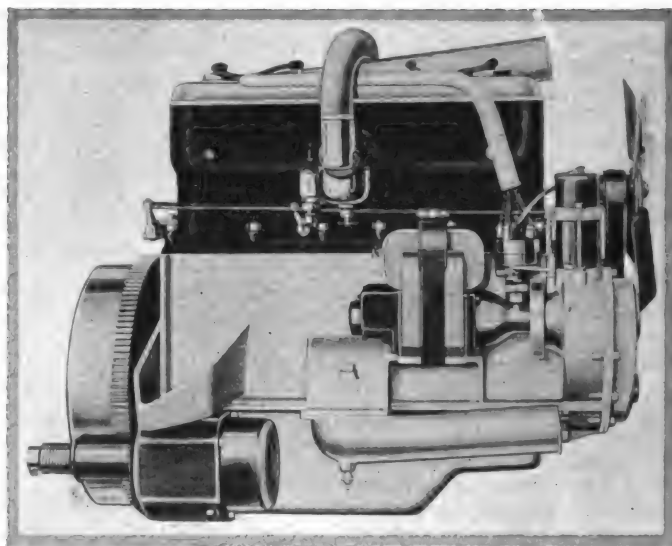
The overflow of oil from the connecting rod bearing, where it is deposited through drilled holes from the main bearings on the crank shaft, to which it has been fed by pressure, is thrown by

New Willys-Knight

Three Distinctive Types of Same, 121-Inch Chassis, Forty Horsepower Power

the rapid rotation of the cranks to the grooves in the sleeves. The natural upward suction carries the oil on each up stroke to cover the entire surface of the sleeves and cylinder wall.

As in the 1916 models, thermo-syphon system of cooling is employed. The heat from the cylinders causes a natural circulation of the water surrounding them, and this water also flows down into the hollow of the cylinder heads. At the top of the sleeve travel the valve ports consequently are subjected to the cooling effect of a water jacketed surface on each side, and the ports are between these surfaces at the time the explosion takes place.

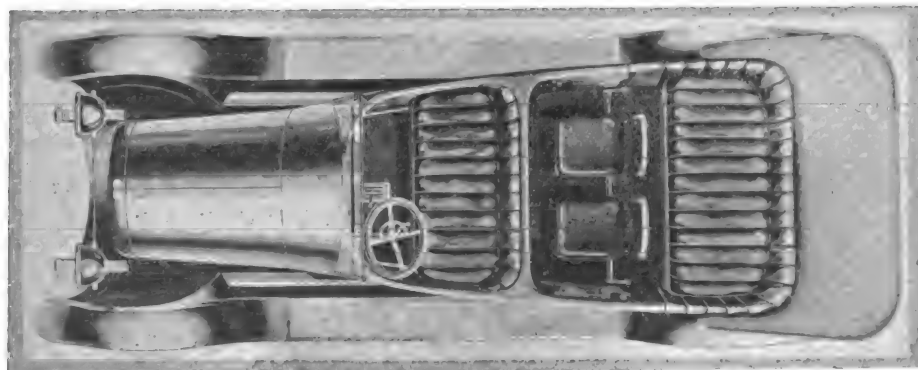


How the Knight Motor is Enclosed.

A horizontal Tillotson carburetor is used. This is bolted to the cylinders and draws hot air by means of an improved type hot air attachment from the exhaust pipe. Fuel is fed by vacuum from the gasoline tank at the rear of the chassis.

The starting and lighting equipment is the Auto-Lite two-unit, six-volt system, the generator being mounted on the right hand side of the motor and driven by chain direct from the crank shaft. The ignition unit is combined with the generator, the coil being carried in a clip on top of the chain case. The starting motor is located at the right rear of the engine for the sake of accessibility. The battery is carried underneath the floor of the operator's compartment and is reached through a detachable panel just above the running board on the right hand side.

The clutch is a leather faced cone, with three tension springs near the outside of the rim for easy engagement.



The Two Forward Seats Seen in the Tonneau Fold Into Back of the Front Seat.

Model Is Offered.

Bodies Mounted On the Which Has Four-Cylinder Plant with Knight Motor.

Under the clutch facing are six studs, which raise the leather slightly, allowing these raised places to be touched first, until the full pressure of the tension springs brings the whole surface to bear. The clutch is also equipped with a brake for slowing down when released from the flywheel and making for easy gear shifting.

In the transmission system the three-speed gearset is located at the rear axle, which makes necessary only one universal joint in the drive system, which means minimum loss of power. This joint consists of two sets of real leather discs in two sets of three discs each.

Motor, Willys-Knight.
Cylinders, Four.
Horsepower, 40.
Bore and Stroke, $4\frac{1}{8} \times 4\frac{1}{2}$.
Carburetor, Tillotson
Horizontal, Hot Air
Attachment.
Ignition, Battery and
Distributor System.
Cooling, Thermo-Syphon;
Cellular Radiator, Ver-
tical Circulation.
Lubrication, Force Feed
and Splash.

Starting and Lighting,
Auto-Lite, Two-Unit.
Clutch, Cone.
Gearset, Three Selective.
Rear Axle, Full Floating,
with Timken Bearings.
Rear Springs, Cantilever.
Wheelbase, 121 Inches;
Tread, 56 Inches.
Tires, 34 by $4\frac{1}{2}$ Inches,
Demountable Rims.
Wheels, Wood Artillery
Type.

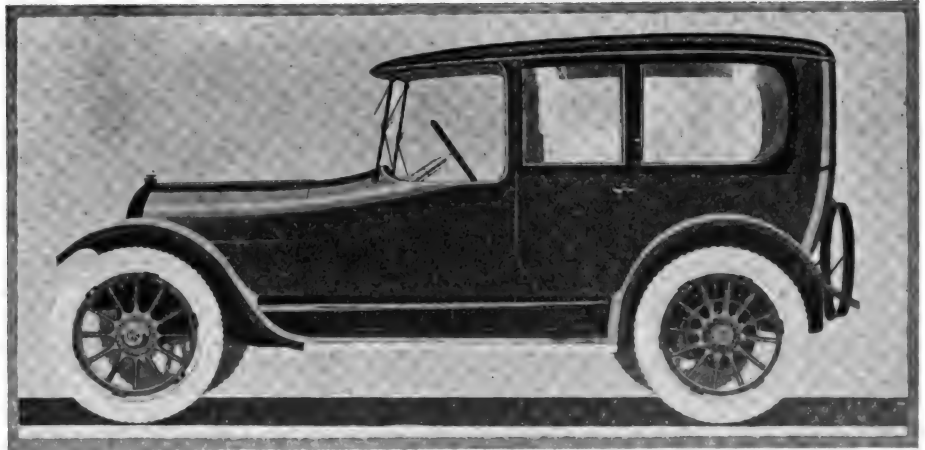
Mechanical Features of Model 88-Four.

The propeller shaft is enclosed in a rugged torque tube, hung on pivots at the front and taking the driving torque and reaction stresses.

The rear axle construction is a full floating type, with spiral bevel gear drive, and Timken bearings throughout. In the differential, which has four bevel gears, taper roller bearings are used. These bearings, as are those in the wheels, are adjustable.

The service brakes are contracting and the emergency expanding, both acting on the same drums on the rear wheels and both being quick adjustable. Quite thick asbestos fabric on woven brass core brake lining insures smooth and powerful action. The dimensions of the service set are $14\frac{3}{4}$ by $2\frac{1}{4}$ inches, and the emergency 14 by $2\frac{1}{4}$ inches.

A conspicuous feature of the new Willys-Knight model is its comfortable riding. A large part of this quality is due to the full cantilever rear springs, which measure 48 inches in length and $2\frac{1}{2}$ inches in width. The front set are semi-elliptics, 38 by two inches.



Model 88-Four Limousine at \$1950.

The front axle is an I beam section, drop forged in one heat without welding, and has adjustable taper roller bearings. The steering knuckles give short turning radius. The steering mechanism is of

the full gear type and irreversible, which means there is no backlash at the steering wheel when the front wheels strike a rough spot in the road surface. With the full gear, when play can no longer be taken up by the ordinary adjustments, it can be overcome by turning the gear so that it presents a new wearing surface, there being four such surfaces, as against one in the ordinary type.

The standard wheel equipment is of the artillery type, with 12 spokes, carrying 34 by $4\frac{1}{2}$ inch straight side tires, non-skid all round on the touring sedan and limousine and non-skid on the rear of the touring model. The rims are demountable.

Great pains have been taken in designing the body work. The upholstery is

like that to be found in the most expensive cars and has that "springy" feel which adds so much to the pleasure of riding. The seats are spacious and have deep cushions in which small spiral springs are set closely together, each being encased separately in a canvas covering that gives a pneumatic cushion effect.

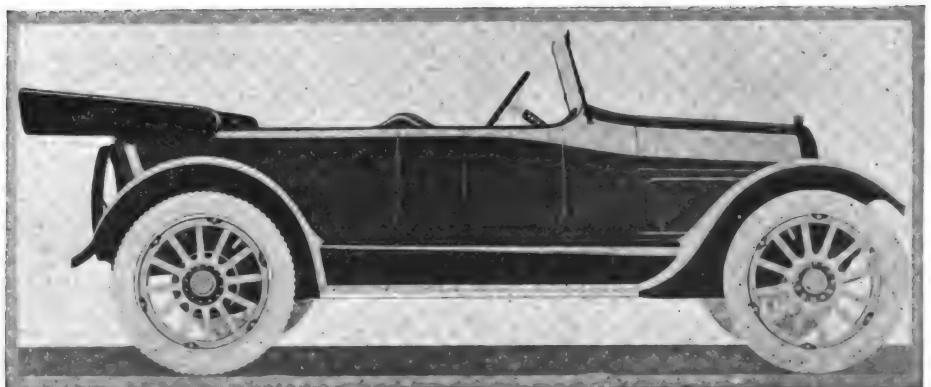
The cowl board and the back of the front seat, though of steel, are grained so skillfully that they seem to be of a high grade wood finish. On the cowl board are arranged the usual electrical and oil pressure gauges and the magnetic speedometer. One part, unoccupied by instruments, has a small glove cupboard.

At the rear of the car are brackets for carrying spare tires. At the front, the radiator differs slightly from former practice in that it bulges at the top, slightly overhanging.

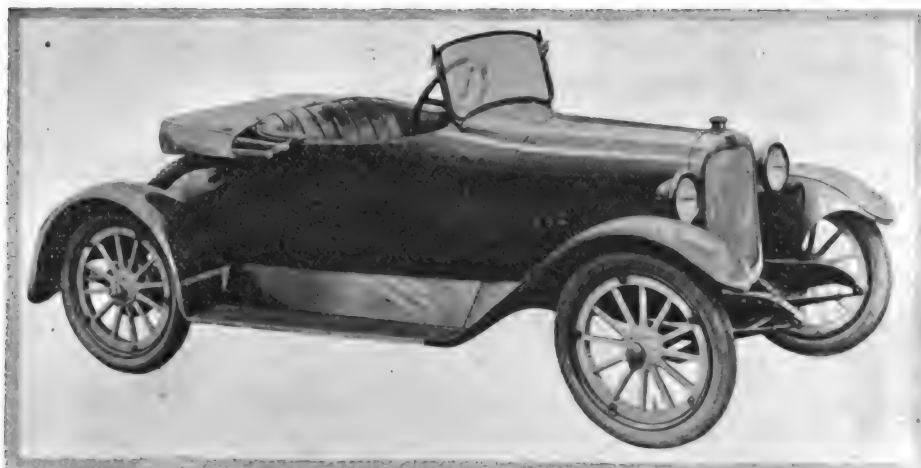
Included in the equipment, in addition to those articles mentioned in the foregoing, is a Boyce moto-meter, headlight dimmers, ammeter, gasoline gauge, electric horn, combination tail light and license plate bracket, extra demountable rim, tire repair kit, jack and pump.

This model has the distinction of being the lowest priced Knight motored car in the world.

The touring sedan has adjustable glass front, silk curtains, dome light, heavy silk cord robe rails and foot rest. The limousine includes the foregoing and in addition has speaking tube, toilet and smoking sets and card case.



Model 88-Four Touring Car, \$1285, First Seven-Passenger Car with Knight Motor.



The Four-Cylinder Maibohm Roadster.

THAT former large and well known builders of horse carriages and wagons are adapting at least a part of their plants to the production of motor propelled vehicles has been evident to an increasing degree in the past few months. One of the companies of this kind to take up the manufacture of pleasure cars is the Maibohm Motors Company of Racine, Wis., which formerly was the widely known Maibohm Wagon Company. The president of the wagon company, P. C. Maibohm, heads the personnel of the new Motors company. The former president of the Maibohm Rubber Company, H. C. Maibohm, is also an officer. J. R. Foster, former president of the Foster-Lockwood Oil Company, and W. C. Maibohm, complete

the personnel of the Maibohm motor car manufacturing concern.

The Maibohm Wagon Company was always distinguished for the high quality of its product, and according to the plans of the Maibohm Motors Company the same standard of quality will be maintained in producing pleasure cars. Production for the first year at least will be confined to the Maibohm roadster, a four-cylinder, semi-racing type of sport car, selling at \$695. The schedule for the first 12 months calls for an output of 2000 cars, two-thirds of which are understood to have already been contracted for by dealers.

The company has a thoroughly modern, well equipped and capacious plant at Racine, but is contemplating removal to some one of the eastern cities that have evinced a desire to have a motor car producing company locate within their environs. The location has not yet been determined upon, but an announcement is expected in the near future.

A Semi-Racing Type.

The Maibohm roadster is designed to appeal to that class of buyers who demand the pleasure of a low and comfortable sitting position, together with an arrangement of controls, pedals and steering wheel that makes for the maximum of ease in operation under all road conditions. The accompanying illustrations show a great many distinctive features in the body lines of the model, as well as in mechanical construction. The car is of light weight and is a smart, low hung, semi-racing type.

Particular attention has been given to the comfort of passengers in designing the seating arrangement. The seats are

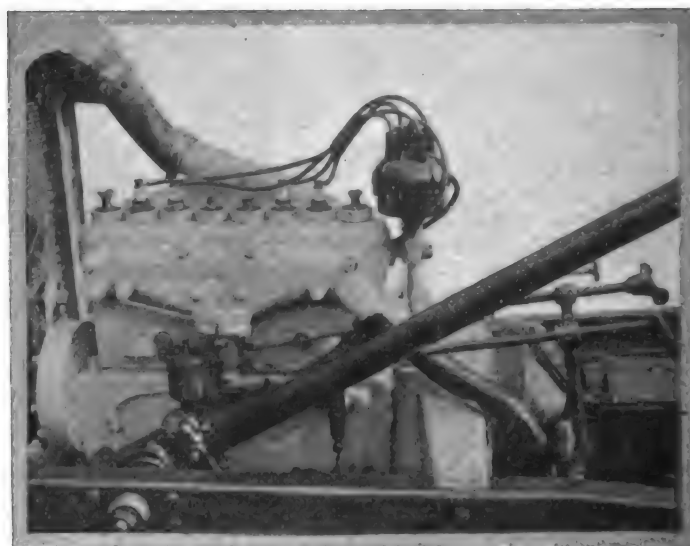
The Maibohm Four

New Roadster Model Made Carriages Is a Very Striking Body Lines and Good

low and heavily upholstered, the pedals are adjustable to varying leg lengths, the steering post has a rakish tilt and the control levers are set back close to the hand of the operator.

Distinctive Body Lines.

The high, narrow radiator is so designed as to blend into the hood and cowl lines on the straight line principle of design, which has become so popular in late models. The doors are unusually wide, to allow passengers to enter the car without soiling or tearing their clothes, and the rear deck is provided with a spacious luggage compartment, easily accessible through a hinged door finished

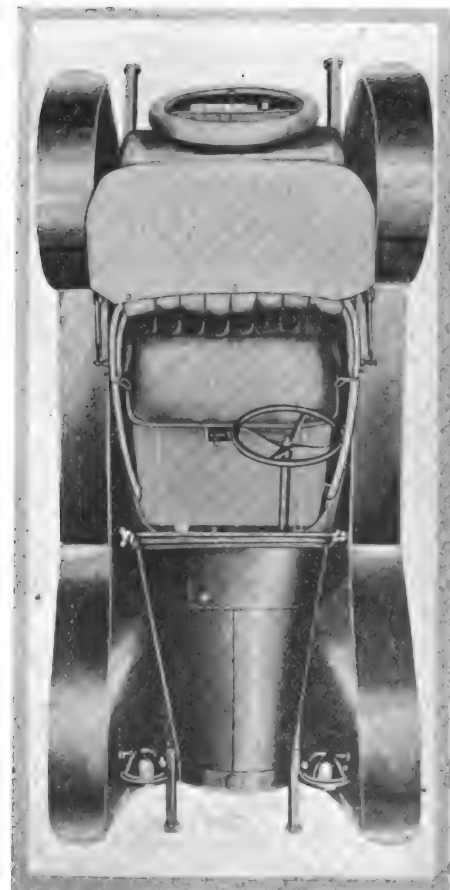


The Four-Cylinder Unit Power Plant.

flush with the body and provided with a Yale lock. This feature will appeal to salesmen and business men, as well as pleasure seekers. The sweeping body lines are accentuated by a one-piece, storm-tilt windshield and a low and rakish top. To further promote the distinctiveness of the model, the makers permit purchasers to dictate the color in which they desire the car to be painted.

The chassis is a very "clean job" in which simplicity and accessibility constitute the keynote of the construction, though strength has not been sacrificed to obtain these desirable features. It is a moderate sized car, as is befitting the type of model. The wheelbase is 105 inches and the tire sizes 30 by 3½ inches, with either wood or wire wheels.

The motor, a four-cylinder, L head, conventional type, with bore of 3½ inches and stroke of four inches, is of Maibohm design and construction. It is a high speed type, develops 15% horsepower, according to the S. A. E. formula, and is in unit with the clutch and gear-



There is Plenty of Leg Room.

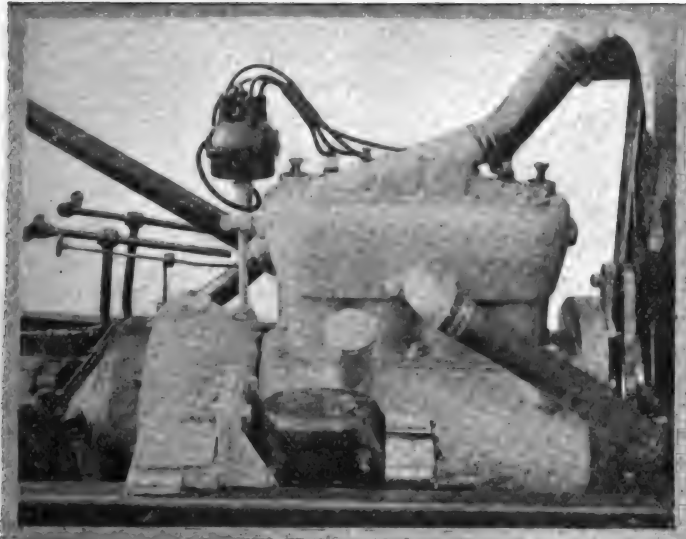
Semi-Racing Type.

By Former Maker of Horse Sport Car with Distinctive Constructional Features.

set. The upper half of the crank case and the cylinder block are cast in a single unit, the lower half of the crank case forming the oil reservoir and consisting of a one-piece substantial steel stamping. The $2\frac{3}{4}$ -inch crankshaft is well mounted on bronze backed, babbitt lined bearings three inches long. To promote smooth operation and a minimum of vibration, the piston and connecting rod assemblies are all equally weighted.

The Lubrication System.

In the lubricating system a cam operated pump delivers oil to the bearings and to troughs in the oil reservoir, whence it is splashed by cups on the

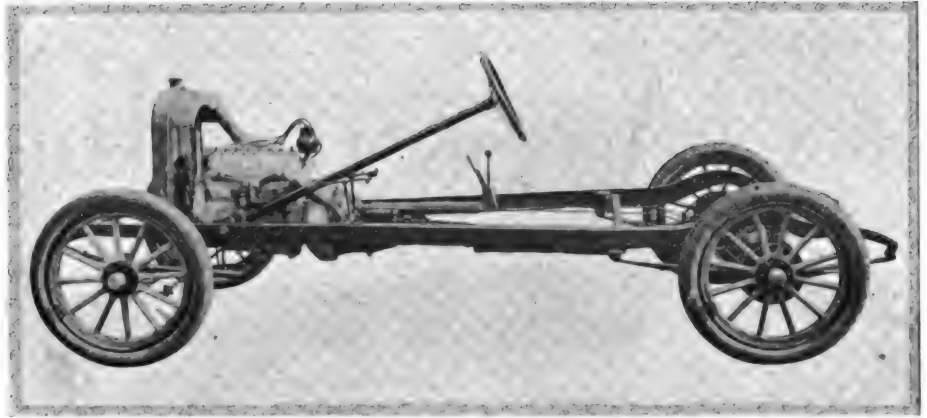


The Motor is a Compact Assembly.

lower ends of the connecting rods to the cylinders and other bearing surfaces of the motor. Oil is carried to the reservoir through a generous sized filler spout. The reservoir is fitted with a positive level gauge, which shows the actual oil level at all times.

The intake and exhaust manifolds are on the left hand side of the block and are cast integrally, a positive aid to carburetion efficiency. A Zenith racing type carburetor is connected directly to the manifold casting, and fuel is supplied by gravity from a tank concealed in the dash cowl. Cooling is by the conventional thermo-siphon method, with large inlet and outlet manifolds cast integrally with the cylinder block. The radiator is high and narrow and of a high efficiency aeroplane type and is provided with an extra large filler spout.

Ignition is an Atwater Kent installation, with automatic spark regulation, current being supplied by a 12-volt, 80 ampere-hour battery, which is conveniently located under the front seat in a



Frame Curves to Allow Underslung Springs.

steel hanger provided for the purpose.

The starting and lighting system in a 12-volt Disco motor generator unit, separate from the ignition, with silent chain direct connected to the rear end of the crank shaft and running in oil and entirely enclosed.

Back of the engine the drive passes through a nine-inch dry plate, three-disc clutch, which is adjustable to easy action and smooth engagement through a removable cover plate. The three-speed gearset is compact in form and the levers have been placed back against the driver's seat, where no reaching is required for their operation. This location also makes for accessibility to the driver's seat.

The rear axle construction is the conventional semi-floating, in which the weight of car is carried on the axle housing, relieving the drive shafts from any duty but propulsion. The drive is through the springs. The master leaf of each rear spring has extra strength through the use of a special heat treated steel. Front springs are $1\frac{3}{4}$ inches wide and 36 inches long, rear $1\frac{3}{4}$ inches wide and 46 inches long. Both sets are of the semi-elliptic variety.

Unusual Shape of Frame.

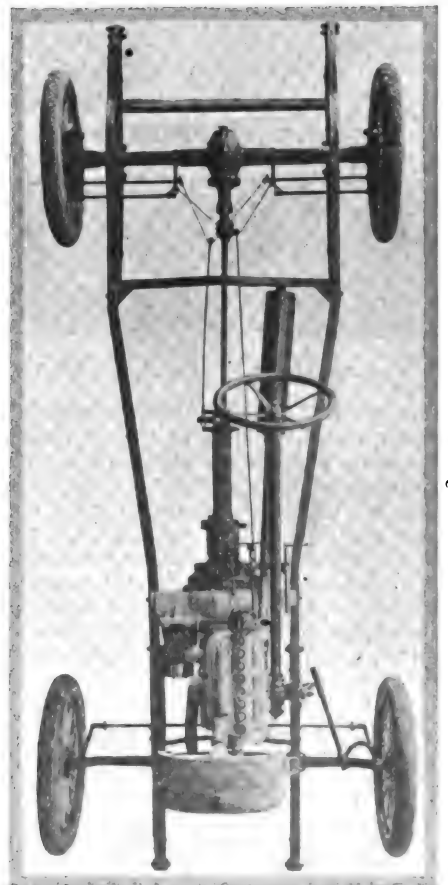
The frame of the Malbohm roadster is somewhat unlike the conventional construction in that it is quite sharply tapered from a point just forward of the rear wheels to the rear support of the three-point suspension power plant. It is a pressed steel channel section three by $\frac{1}{2}$ inches, and curved over the rear axle to permit underslung spring suspension and low mounting of the body.

The feature items of the standard equipment, in addition to those already mentioned, include a flush type speedometer, lock switch, electric horn, rear

tire carrier, one-man top, tools, etc.

The Van Dorn Electric tool Company of Cleveland, O., in their usual energetic method of following up prospects traced down an inquiry for an electric drill and found that the applicant for the instrument was safely ensconced inside the state prison at Joliet, Ill. While not wanting to lose a sale their representative thought it would be better policy to turn the correspondence over to the warden than to deliver the drill to the inmate, who was on the books as convict 7572.

The directors of the New York State Motor Federation have taken steps toward the amalgamation of the two large motor organizations of New York state, which represent 115 motor clubs.

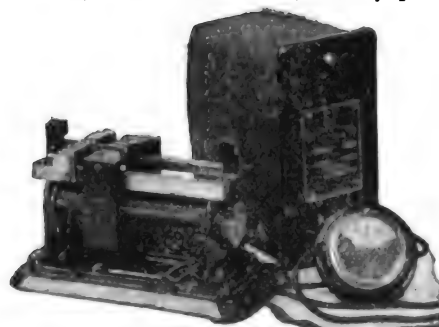


Shape of Chassis is Unusual.



F-F BATTERY CHARGER.

The new patented F-F magnetic rectifier requires practically no upkeep expense, the cost per charge being simply for the current put into the battery, which makes the cost of operating very small. A six-volt, 80 ampere-hour battery can be charged with one kilowatt-hour or unit of current costing but from three to 10 cents, depending upon the local rate per electric unit. A larger or smaller capacity battery would cost in proportion. This rectifier is self-starting and automatic in operation, a magnetic circuit breaker opening the charging circuit whenever the alternating current is turned off or temporarily interrupted. The outfit with ammeter is readily port-



The F-F Battery Charger.



The Bantam Running Board Mat.

able, weighing but 12 pounds, and the charge operations can be started almost instantly and most anywhere a light socket is found. Type 1636 rectifier operates on 110-volt, 60-cycle alternating current and charges six or eight-volt batteries of any amperage-hour capacity. The rectifier itself is of 60-watt capacity.

Manufactured by the France Manufacturing Company, Cleveland, O. Price of outfit complete with 20-ampere meter, \$15, f. o. b. Cleveland.

RUNNING BOARD MAT.

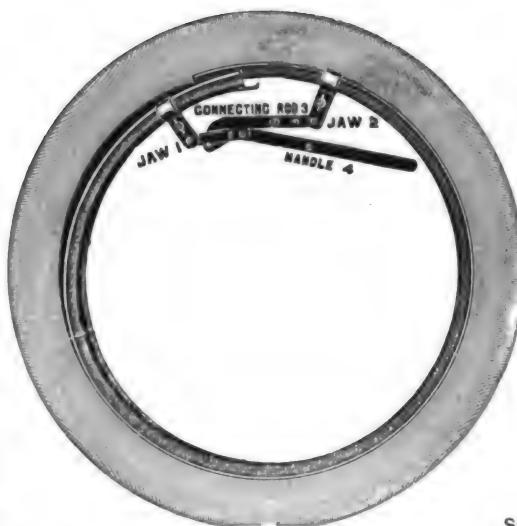
The Bantam automobile running board mat insures sure footing when entering or leaving the car and freedom from dirt, mud or slush from the inside. It is made of the best grade fibre and the clamps are of spring steel. When required it

may be instantly removed, cleaned and replaced. Their installation is said to add to the neat appearance of any car.

Manufactured by the Bantam Manufacturing Company, 64 Pearl street, Boston, Mass. Made in two grades, one selling at \$4 per pair and the other at \$3 per pair.

K. P. UNIVERSAL RIM TOOL.

The K. P. universal rim tool for use on transversely split rims, such as the Baker, Stanweld, Kelsey, Detroit and others of that type, is the most simple device on the market and does the work quickly and effectively. It has been the endeavor of the manufacturer to evolve a



K. P. Universal Rim Tool.

tool that is simple in operation and actually does all claimed for it.

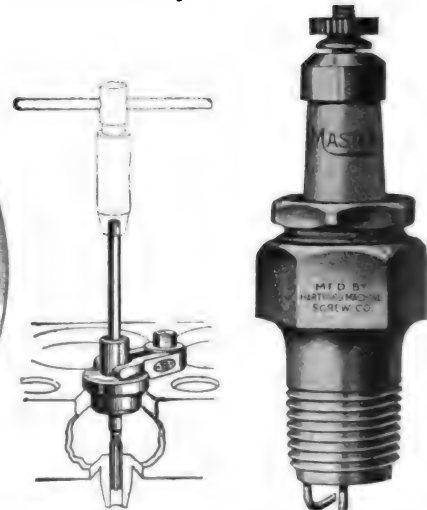
Made by the K. P. Manufacturing Company, 250 West 54th street, New York, N. Y. Price, \$2.

CALORITE IN MASTER PLUGS.

In the August issue it was erroneously stated in the description of Master Calorite spark plugs that a porcelain insulator was used. The fact that the makers have abandoned the use of porcelain is one of the claims put forth for the superiority of this make of plug. Calorite, a new insulating material being substituted because of its greater resistance to heat and cold conditions. Before adopting the material the makers subjected it to the most severe tests, one of these being to heat a Master Calorite plug to a white heat and then plunging it into cold

running water. The plug did not show the slightest indication of a crack; an ordinary porcelain plug broke before reaching a white heat and before it was put into water. Another test consisted of trying out Calorite as an insulating material, and it was found to withstand a 10 per cent. higher voltage than the finest porcelain obtainable. The makers of Master Calorite plugs are this year featuring the model F, a new model designed especially for Ford and Reo cars. It is of unusual length, putting the spark way down into the explosion chamber. In addition to this model there is the regular length Master Calorite. All Master plugs are leak and soot proof and of superior quality.

Manufactured by the Hartford Machine



Stevens Reamer and Guide, at Left; Master Calorite Plug at Right.

Screw Company, Hartford, Conn. List prices, regular length plug, \$1; extra length and Ford model, \$1.25.

STEVENS REAMER AND GUIDE.

The Stevens valve reamer and guide for oversize valves on Ford cars bolts to the cylinder head, centering the reamer in the valve guide to insure an accurate job. The reamer is 1/64 inch oversize and is accurately ground to size. The reamer guide is furnished with a clamp and bolt for securing to the cylinder head, and the oversize valve heads are electrically welded to stem, 1/64 inch oversize.

Marketed by Stevens & Co., 375 Broadway, New York, N. Y. Price of valve stem reamer, \$1.50; reamer guide, without reamer, \$1.50; oversize valves, 20 cents each.

ELECTRIC GLUE POT.

Glue, to be effective, should be applied hot and where there are dangerous fumes and often raw gas, oil and grease around it is not good policy to have an open flame about. A glue pot which can be used where these conditions do exist is the Mabey electric glue pot. As there is no flame, soot or smoke, nor intense heat, all danger of fire is eliminated. It consists of a heat retaining jacket made of heavy ingot iron, containing the electric heating unit. Into this jacket is set a substantial copper glue cup. The even distribution of heat which radiates in all directions gives the same efficiency as water. The consumption of electricity is kept down to a minimum because the insulation prevents loss of radiation and waste of current. The outfit is simple, durable, economical and efficient. Usually equipped with six-foot cord and plug and arranged for 110 volts.



Mabey Electric Glue Pot.



Boyce Moto-Meter.

Distributed by Mabey's Electric and Manufacturing Company, Indianapolis, Ind. Prices, one quart, \$9.50; two quarts, \$11; three quarts, \$12.75; four quarts, \$15.75.

GARAGE HEATER.

The Superior Safe Garage Heater is an efficient air tight furnace, consisting of a combustion chamber and tubular radiator, which are secured inside a heavy galvanized casing lined with thick asbestos board. The combustion chamber contains a single piece cast iron drilled burner, a basket of patent English fuel and a small pilot light. Perfect combustion takes place inside the chamber and every unit of heat is liberated ere the products escape through the exhaust pipe. All the air consumed by the heater enters through an intake pipe placed at a safe place outside the building, so that no fumes or gases can enter,

thus insuring safety. The heater is provided with an automatic self-locking, gas proof door, which need be opened but once during the cold season to light the pilot, as this uses so little gas to keep it self going that it is usually left burning all the time. An adjustable spud is attached to the valve and this regulates the flame and gas pressure at all times, so that there is no danger of overheating when left to burn all night. In the centre of the door is a small, circular window, made of mica and protected by a safety gauze wire, which enables you to see the condition of the fire inside at any time. It is constructed so that it will not mar or blister the finish of any car, no matter how near it may be. While furnished to set upon legs, the heater may be bolted to the wall if desired. This outfit can be equipped with water heater at small additional cost.

Made by the Superior Manufacturing Company, N. S., Pittsburg, Penn. Prices



Superior Safe Garage Heater.

for heater for garage up to 3000 cubic feet, \$15; up to 5000 cubic feet, \$25.

BOYCE MOTO-METERS.

Engineers of the Willys-Overland factory have made the Boyce Moto-Meter regular equipment on all 1917 Willys-Knight cars. At their suggestion the manufacturers of this instrument have designed for and are now ready to offer to Overland owners this instrument, which differs from others of the same make only in the design of the stem. Attachment has been arranged so that anyone can fit it to his car by simply enlarging the hole in the radiator cap.

Made by the Moto-Meter Company, Inc., Long Island City, N. Y. Prices upon application.

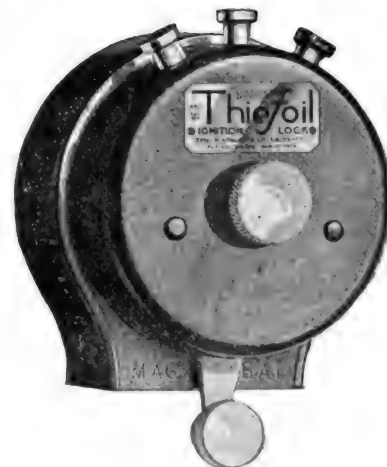
THIEFOIL LOCK FOR FORDS.

The Thiefoil ignition lock for Ford

cars is a new type of permutation lock, so constructed as to be easily attached to the face of the standard Ford switch without making any change in the wiring arrangements or requiring the use of any special tools. Primarily this is a combination lock without keys or dials. The ease with which it may be operated when the combination is known makes it particularly adaptable for application to automobile ignition switches. Projecting from the top of the lock are three buttons, each of which must be pressed a certain number of times to operate the lock. Locking the switch is accomplished by simply pressing one of the buttons, which upsets the combination, when the whole operation must be gone through before the switch lever can be moved. There are more than a thousand possible combinations which may be arranged. The construction is such that it is readily removable when unlocked. The user can make up any desired combination within range of the lock by set-



Ideal Dash Board Primer.



Thiefoil Lock for Fords.

ting the indicators on reverse side of it.

Made by Caskey-Durpee Manufacturing Company, Marietta, O. Retail price, \$3.50 each.

DASH BOARD PRIMER.

The Ideal auto dash board primer, model E, is designed to overcome the ordinary difficulty of starting a motor in cold weather. It is attached to the feed line and has positive feed, delivering just the proper amount of fuel to the manifold when required. The stem of the device is threaded and when not being used it can be made to close the check valve to prevent leakage by turning the handle a few times. Furnished complete with tubing and connections ready to install.

Marketed by the Ideal Brass Works, 10th and Canal streets, Indianapolis, Ind. List price, nickel plated, \$3.



THE value of a good garage on an estate, or on the lot with the city dwelling, cannot alone be computed from the saving effected in keeping and maintaining the automobile alone; it is a factor in enhancing the appraisal of the entire property. If the home owner has the means of owning and operating an automobile, his home is usually of the better type and its salability is greatly increased by the presence of a garage on the property, for over 25 per cent. of the possible purchasers of such an estate would desire a garage, consequently, if one is already erected the attractiveness of the place has a far greater appeal.

Home owners often destroy the beauty of their places by locating their garages too near the homes or the streets. This is some times made necessary by the lack of room, but, whenever possible the garage appears at its best as an improvement when placed at some distance back from the sidewalk and apart from the home.

Types Previously Described.

In the previous articles on garage construction of concrete, cement and stucco, one of each type was described. A stucco garage was among those illustrated, but the frame was made of pipe. The building herein described and illustrated is similar in type and style, except that it has a wooden stud frame and wooden roof. It is the most economical form of construction for this

type of garage and the most handy to build, as the material, unlike pipe and angle irons, may be obtained almost anywhere. A building erected in this way is also fireproof for all practical purposes.

Preparing Frame for the Stucco.

There are two methods of preparing the frame for the stucco. Ribbed metal lath without furring, or sheathing, which method is known as "solid stucco" treatment, may be used, or wire lath and furring on wood sheathing may be adapted. There is not much choice between the two except that the latter is more expensive in the first cost. Adopting the first named method, the metal lath is nailed to the wood studs with ribs running hori-

zontally. Three coats of stucco are applied on the outside and one coat on the interior.

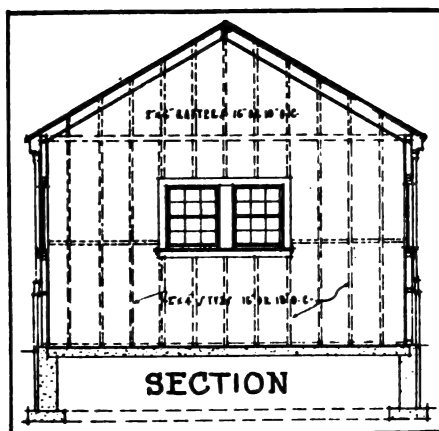
In employing the second method one-inch sheathing is placed on the wood studs and after it is covered with water proofing paper, furring strips are applied. Expanded metal lath or wire fabric is nailed to the furring strips to receive the stucco and wire lath is used on the interior for the cement mortar. In erecting the frame and preparing it for the stucco, openings are made at the proper places for the doors and windows.

The frame is made of 2x4-inch studs, placed 16 inches off centre and the roof of 2x6-inch rafters, set over the studs and secured by 4x4-inch plates. The roof is sheathed over and either wood shingles or tile may be used as a thatch. Wire lath and cement plaster should be applied to the under side of the roof to make it fireproof.

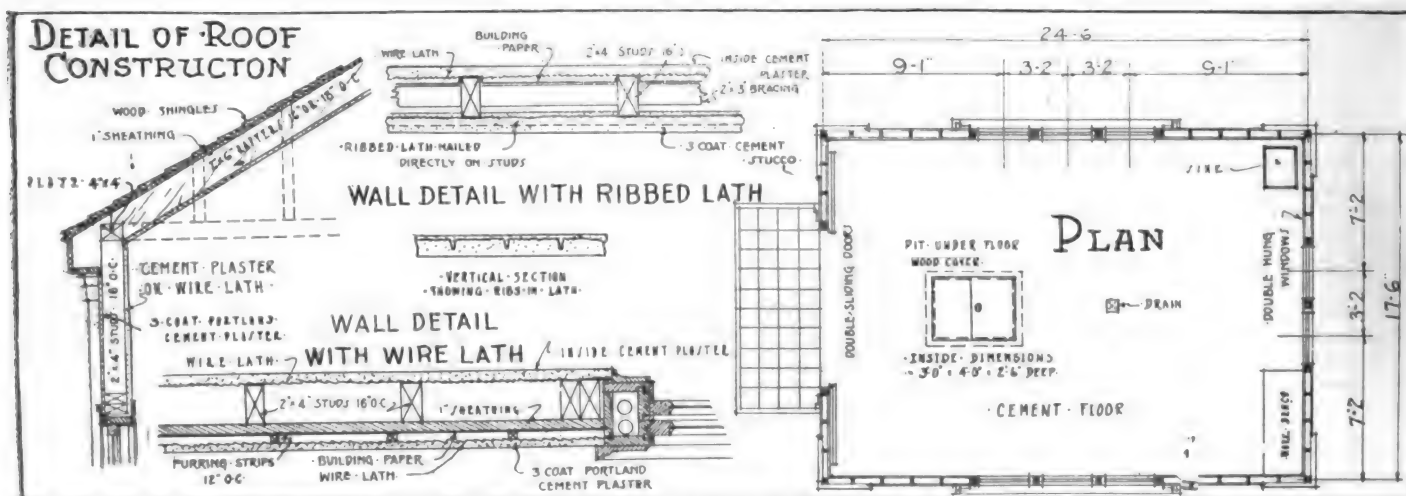
Formulas for Mixing.

The formulas for mixing the different coats of stucco and cement plaster and the concrete foundations have already been given in this series, as well as the most efficient and advantageous methods of laying the concrete flooring.

This garage, for which sketch plans are given, is suitable for one large car or two small ones, and can be worked up in different designs to harmonize with landscape or architectural surroundings.



Cross Section of Wood Stud Frame.



Building Plan and Specifications for a Stucco Garage with Wood Stud Frame.

Cold Weather Coats for the Woman Who Motors.

Photographs by Joel Feder, New York.



Semi-Military Motor Coat in Rose Zibellin, with Attached Hood Cap of Self Material. (J. M. Gidding, N. Y.)



All-Weather Coat of Castor Brown Zibelline. Silk Stitch, Button Trim. (Oppenheim & Collins, N. Y.)



A Striking and Practical Model. Miss Shelton in Coat of "Heather Velfur," Trimmed with "Butifur." Hat of "Luster Broadtail." (Coat by Bergdorf-Goodman, N. Y., Hat by Knox, N. Y.)

At the Left, Deep Winter Motoring Coat of Beaver Throughout, Featuring Full Flaring Lines, Deep Pockets and High Roll Collar. (Lamson & Hubbard, Boston.)

At the Right, Seal Motor Coat, Displaying "Nipped" Waistline and Flaring Hem. Cuffs, Collar and Border Are Made of Kolinsky Fur. (Lamson & Hubbard, Boston.)



HIGHWAY ENGINEERS NEEDED.

Demand Has Become Great—Several Universities Include Courses in Their Curriculums.

THE demand for highway engineers has become so great and such an important factor as a result of the good roads movement, incident to the development of the automobile industry, that the National Automobile Chamber of Commerce has become interested in the work of stimulating the interest in this profession. At present there is a great scarcity of competent highway engineers to carry along the work in an efficient manner. In a bulletin sent out by the N. A. C. C., the statement is made that first and second year engineering students can specialize in highway engineering in the junior and senior years with a feeling of certainty that the field offers ready employment and better chances for rapid progress than almost any other engineering field.

Replies to inquiries sent out by the chamber showed that of 75 universities and colleges having civil engineering courses, practically all include some road engineering work during the last two years, a certain amount of which is obligatory, while a more extensive study of the subject is usually elective or optional. Thirty-one institutions give considerable attention to highway engineering, a number providing a post-graduate course in this branch and conferring degrees of Master of Science or Civil Engineering.

State highway engineers are inclined to advocate a post-graduate course in the subject, maintaining that a thorough grounding in the usual civil engineering subjects is essential and should be supplemented with a special course in highway work. It is contended that a few hours each week on one or two semesters in the junior and senior years is not sufficient technical training to qualify men for responsible positions as road engineers.

Reports from a number of institutions which replied to the inquiries regarding their civil engineering courses, are given below. Full information regarding the courses at any of these institutions will be sent upon request addressed to the institution.

Columbia university, in New York City, claims to be the first to establish a complete separate graduate highway engineering curriculum and to confer degrees of highway engineer. This was founded in 1911, under Prof. Arthur H. Blanchard, and embraces 16 courses.

The Oregon State Agricultural College, at Corvallis, offers a four-year special course leading to a degree in highway engineering. It requires 16 to 17½ hours a week in both semesters each year.

Courses of instruction in engineering in the University of Virginia, at Charlottesville, have been rearranged to bring

the highway subjects together in the winter term, making a special course taken by all civil engineering students and open to others also.

A special two-year highway course, following two years of civil engineering studies, is provided by the University of South Carolina, at Columbia, which confers certificates in highway construction upon graduates.

The College of Engineering, Ohio State University, at Columbus, claims one of the best highway engineering courses in the country. It provides a graduate course in the fifth year leading to the degree of master of engineering.

Other institutions offering similar special graduate instruction are the University of Michigan, at Ann Arbor; Rensselaer Polytechnic Institute, at Troy, N. Y.; Massachusetts Institute of Technology, Boston; University of Wyoming, Laramie; Iowa State College, Ames, and the University of Maine, Orono.

Extension courses in highway work for graduates of the customary four-year civil engineering courses and open also to practising road supervisors, engineers, surveyors, etc., are offered by Purdue University, at LaFayette, Ind.; University of Illinois, Urbana; Agricultural and Mechanical College of Texas, College Station; Pennsylvania State College, College, Penn.; Kansas State Agricultural College, Manhattan, and the University of Nebraska, Lincoln.

An extension correspondence course in highway subjects was started last January by the University of Oklahoma, at Norman. This is in addition to the civil engineering course, which embraces some study in the subject, and is intended for practising road officials. Half a dozen states are represented in the correspondence course.

GOOD ROADS DAY IN N. H.

Governor Spaulding of New Hampshire issued an official proclamation appointing Saturday, Sept. 30, as Good Roads Day in New Hampshire. This is the first year that a governor of New Hampshire designated a Good Roads day and it is expected that many public spirited citizens will turn out and give their time, labor and use of teams to the interests of improving road conditions wherever possible.

CROSSING WARNINGS.

F. W. Pelton, publicity manager of the Mitchell Motors Company, Inc., of Racine, Wis., in a suggestion which he proposes to make to highway commissions has a novel idea for warning motorists of the location of a railroad, crossing, dan-

gerous turn or narrow bridge.

Mr. Pelton's idea involves the painting of the telephone or telegraph poles on either side of the danger point so that they would make a conspicuous warning to the drivers both day and night. He suggests that the poles could be painted about 10 feet from the ground for about a five-foot strip with a red band, a foot wide painted in the centre.

MASSACHUSETTS ROADS.

Over 18,000 miles of the 23,000 miles of roads comprising the Massachusetts state highway system have been improved. Over \$11,200,000 has already been spent for construction work. There is 4348 miles of roads in the cities and 18,682 miles in the towns. There are over 300 towns.

The system embraces main trunk lines that connect Boston with all the principal cities in the East over the most direct routes. Over 7500 miles are gravel roads and 3000 miles plain macadam. A considerable portion of the system is from 12 to 20 years old, but these roads are still in good condition and over a million dollars is spent annually in repairing, resurfacing and maintenance.

COMING EVENTS

September.

Show (state fair), Salem, Ore. Sept. 25-30
Race (track), Trenton, N. J.Sept. 29
Race (speedway), New York, Sheepshead Bay Speedway.....Sept. 30

October.

Convention, National Association Automobile Accessory Jobbers, St. Louis.....Oct. 2-5
Race (speedway), Omaha, Neb..Oct. 7
Race (speedway), Philadelphia..Oct. 7
Show, Troy, N. Y.....Oct. 7-14
Race (speedway), Chicago.....Oct. 14
Show, Dallas, Tex.....Oct. 14-31
Race (speedway), Indianapolis..Oct. 19
Race (track), Kalamazoo, Mich..Oct. 21
Tour, Commercial Car Reliability, Los AngelesOct. 22-23

November.

Race, Vanderbilt Cup and Grand Prix, Santa Monica.....Nov. 16-18

January, 1917.

Show, New York City.....Jan. 6-13
Show, Cleveland, O.....Jan. 13-20
Show, Montreal, Que.....Jan. 13-20
Show, Chicago.....Jan. 27-Feb. 3

February.

Show, Newark, N. J.....Feb. ..
Show, St. Louis, Mo.....Feb. ..
Show, Minneapolis, Minn.....Feb. 3-10
Show, Omaha, Neb.....Feb. 26-March 3

March.

Show, Boston, Mass.....March 3-10

**HANDY PRIMING DEVICE.**

(Figure 227.)

A suggestion for a handy engine primer is illustrated in the accompanying sketch. The device consists of a small copper tank with a shut off valve fitted in its base, the tank being located on the front dash. From this valve a copper pipe line should be run to the intake manifold of the cylinders. Priming can then be done without raising the hood, the gasoline being taken into the cylinders in the form of gas instead of in liquid form, as is the case when priming direct. To operate the device it is necessary only to open the shut off valve and allow a sufficient quantity of fuel to run into the manifold. On engines equipped with electrical starters this arrangement will be found particularly effective.

SIMPLE OIL FILTER.

(Figure 228.)

As a means of making some use of the old oil that is drained out of the crank cases, or accumulates from one cause or another, the following illustrated filter has been devised by an ingenious mechanic. An oil can such as many of the nationally advertised prepared oils are put up in makes a desirable tank. While the size is not particularly important, the five-gallon cans are convenient and about suited to the amounts of oil usually drawn off from a car at a time. Remove the top, making a container with open top and by means of a partition of like material divide this vertically into two equal parts, soldering the joints and making same oil tight. At the bottom, near the front of one of the compartments, solder in a small petcock for drawing off the strained oil. Call this compartment that has the petcock the discharging tank and call the other compartment the receiving tank. Pour what oil you wish to strain into the receiving tank. Take a clean piece of waste and saturate fully with fresh oil. Immerse this in the receiving tank so that it hangs over the partition into the discharging tank. The oil in the receiving tank at once will begin to flow slowly from this tank by capillary action into the discharging tank, leaving the dirt and sediment behind. By the petcock the strained oil should be drawn off from time to time, taking care that the strained oil does not reach the level of the dirty oil, in which case the action will cease.

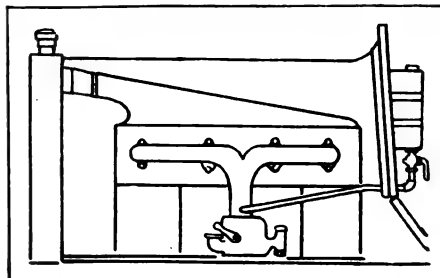


Fig. 227—Showing How Home Made Engine Primer Is Installed and Operated.

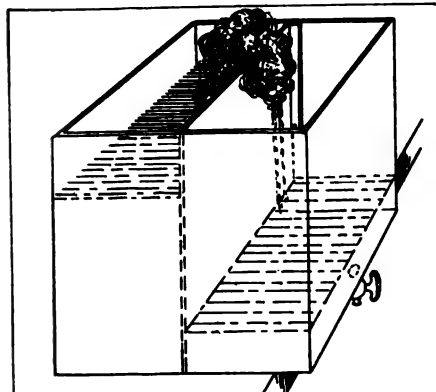


Fig. 228—Construction and Operation of a Simple Oil Filter.

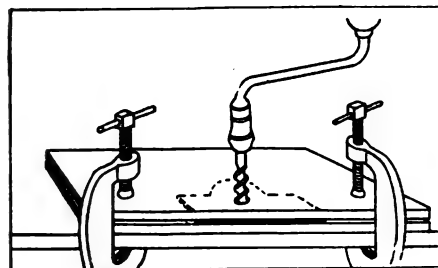


Fig. 229—Method of Simplifying Process of Drilling Shim Stock.

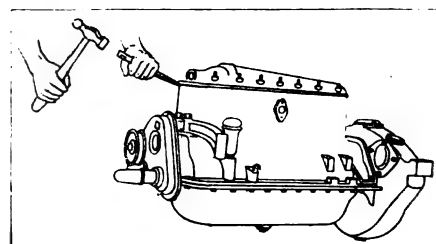


Fig. 230—The Hammer and Chisel Method of Removing Cylinder Heads, Which Is Injurious to the Gasket.

DRILLING SHIM STOCK.

(Figure 229.)

To bore a clean, sharp hole in thin shim stock it is only necessary to clamp same tightly between two flat boards and drill through boards, shim stock and all with a good sharp wood auger and bit stock. Several thin pieces of shim stock may be drilled at a time in this manner if desired.

REMOVING CYLINDER HEAD.

(Figure 230.)

Now that so many en bloc motors have removable heads, it is in order to correct a practise which, in the removal of these heads is more common than correct. In the first place, a word respecting the nature of the material which is used in making this very important joint. The manufacturers use a combination copper and asbestos gasket, in which a sheet of asbestos is held, as in a sandwich, between two sheets of thin annealed copper. The asbestos provides the elasticity which allows for expansion and contraction, while the function of the copper is to present a surface to the iron faces of the head and cylinder castings which will not stick, so that the head can be removed without difficulty.

In remaking this joint, after taking off head for carbon removal, or other causes, many mechanics deliberately sacrifice the non-sticking quality of the gasket by coating it with white lead or similar jointing material, being more concerned with making a tight joint than with the convenience with which the head may be subsequently removed.

When it becomes necessary to take off a head which has been applied in this manner, or which, for any other reason, comes off with difficulty, instead of going at it with a hammer and chisel, as shown in cut, which not only spoils the gasket, but roughens the smooth surfaces of the castings, the following easier method is suggested:

Slack off the nuts holding the head to the cylinder, being careful to turn each nut the same distance, say one complete turn. Now start the motor. As soon as leakage is observed, which may not occur until the motor warms up, the joint is broken and the head may, in most cases, be easily lifted without the use of wedges or other tools.

REMOVING BOLTS.

(Figure 231.)

When you come across a bolt that is so located as to be awkward to get at with either an ordinary or a socket wrench, or if you find one that screws too hard to be easily worked by the fingers, yet easy enough to make a wrench seem a waste of time, here is a way to do it quickly on the next occasion. Having removed the bolt, clamp it in the vise between two pieces of soft brass (to protect the threads) and with two blades set side by side in your hack saw cut a slot in the head of the bolt from any corner to the one opposite, using care not to cut too deeply, but just so that a screw driver may have a secure hold in the slot. Now when screwing the bolt it will be found to be an easy matter to quickly do so with a screw driver, requiring only a final setting up with a wrench.

COUNTERSHAFT BRAKE.

(Figure 232.)

The countershaft clutch with some lathes has a faculty of keeping up an annoying and bothersome spinning after the clutch has been disengaged. Often times a piece of wood is used between the lathe casting and cones to stop this spinning. Some people still use the dangerous method of setting up a braking action with the palm of the hand. A better method than either of these, and one that puts to some service cast off junk, is as follows: Take a piece of discarded brake lining long enough to reach from the counter shaft guide rod over around the clutch pulley and hang a little below the same. Make a couple of clips of substantial sheet iron, as shown in illustration. Pass one of these around guide and fasten to end of brake lining with a couple of copper rivets or small bolts. Fasten the other in a like manner to the other end of the strap and make a hole in the clip just large enough to run a wire through, the end of which twist around a small pin or nail. On the other end of this wire at a convenient length fix a handle. Now when disengaging the clutch pull down on this wire and the brake lining, exercising its function as in an automobile, will effectively stop the shaft, the time required to do this depending upon the force with which the wire is pulled.

CLEANING ACETYLENE PIPES.

(Figure 233.)

The piping of an acetylene gas generating system should be blown out at least once a week, this being done by connecting a tire pump to the tube where it connects with the generator. The burners ought to be removed during the operation so that particles of carbide may be blown out. A quick way of cleaning burners in this way is to hold them by means of pliers over the outlet of a compression relief cock while the engine is operating, as shown in sketch. The pressure from the compression stroke of the motor will force the carbide particles through the outlets.

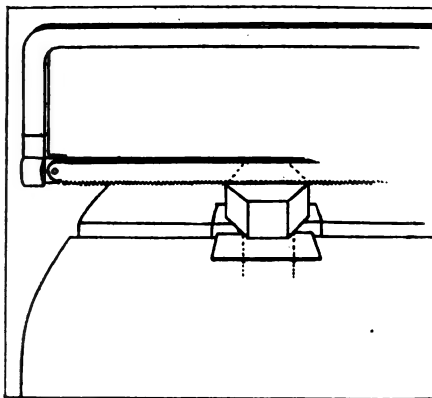


Fig. 231—A Slot Cut in the Head of a Bolt Will Greatly Simplify Its Future Removal.

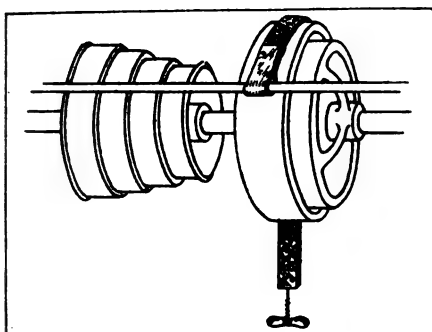


Fig. 232—How the Suggested Countershaft Brake Can Be Utilized in a Private Garage.

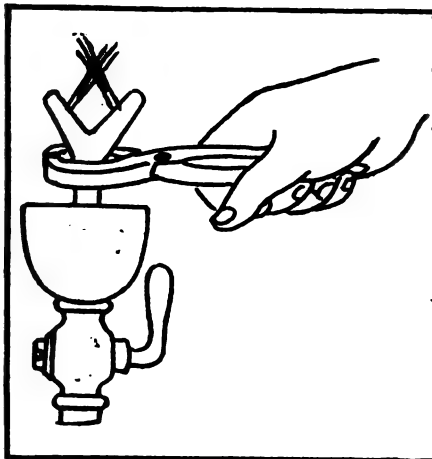


Fig. 233—A Simple but Practical Way to Clean Out Clogged Acetylene Pipes.

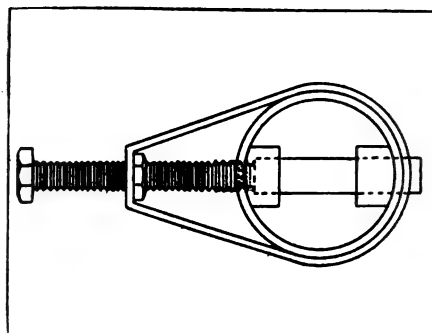


Fig. 234—A Practical and Easily Made Wristpin Removing Tool, Showing Its Position on the Piston.

WRISTPIN REMOVER.

(Figure 234.)

In the illustration is shown a wristpin drawing tool, which was constructed by a repair man during his idle moments. It consists of a clamp made of band steel, the ends of which are welded together. The flat side of the clamp is drilled and carries a threaded bolt and nut. Diametrically opposite this hole is another of sufficient size to allow the wristpin to be forced through. The action is obvious. The clamp is slipped over the piston, and by turning the head of the bolt with a wrench, considerable pressure is brought to bear against the wristpin and it is gradually forced out of the top connecting rod bearing without injury to the piston.

CARE OF SPARK PLUGS.

Owners who make it a practise to disassemble the spark plugs whenever they require cleaning, should exercise the greatest of care when reassembling the parts, especially when adjusting the hexagon nut that compresses the washer sealing the space between the porcelain and the shell. If the nut is screwed up too tightly the porcelain is apt to be cracked as the temperature of the motor rises.

After replacing the plug in the cylinder it is a good plan to test it for leakage. When the motor is running squirt kerosene between the hexagon nut and the porcelain. Any leak will be noted by the rising of bubbles. If it is shown that the plug leaks, inspect the washer. It may be that the material has become hardened and, if so, a new gasket should be used.

When testing for leaks, the kerosene should also be applied to the threads of the shell to ascertain that the plug is screwed up tight in the cylinder. A leak around the threads can be stopped by smearing with a mixture of lubricating oil and flake graphite. This will also facilitate future removals.

Radiator manufacturers advise that hard water in the cooling system is detrimental, because when heated the fluid produces a scale which deposits in the form of fine, brick colored powder. This substance clogs the fine passages and greatly impairs the cooling efficiency. A simple test to determine the nature of water is to make a soap solution and fill a glass vial about half full. Then add a few drops of the water that is to be examined. If the fluid is hard the solution will turn a milky color.

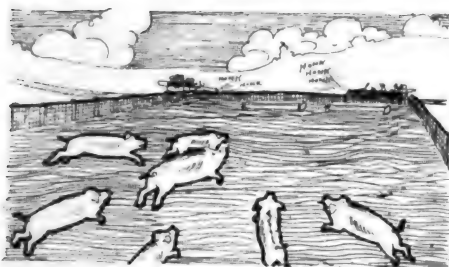
It is a good plan to occasionally remove the old lubricant from the grease cups and insert a wire in the passage leading to the part to be lubricated, as this passage is apt to become clogged. To remove lubricant which has become hardened, insert a heated wire and then clean well with kerosene or gasoline. When renewing the supply of grease, fill the cup about half full and then screw it down. Next refill the cup and replace it.

Graphic Items From the Fortnight's News.

A business firm in Taunton, Mass., erected a sign, "Automobilists Keep Out," on the exterior of the shop after a large automobile had jumped the curb and crashed through one of the plate glass windows.

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Two farmers in Kansas who had been in the custom of feeding their hogs from an automobile were mystified because the animals seemed to grow poorer, although their appetites were prodigious. One of the farmers, determining to solve the mystery, kept watch and found that



the hogs every time they heard an automobile passing by in an adjoining road, would run the length of the field, thinking they were going to be fed.

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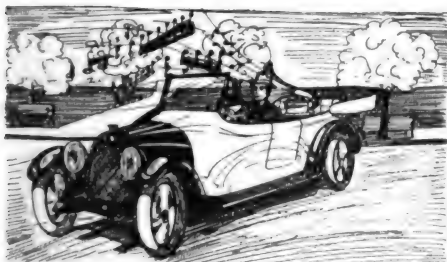
The automobile club of Columbus, O., is conducting a membership campaign to secure a total of 3500 members and has already enrolled 1750 members in Franklin county.

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Thefts of over \$250,000 worth of automobiles in the past year in Chicago have been reported.

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Harmonizing with the purring of the gear box and the resonant popping of the motor as though they were drum and string accompaniments, a motorist of



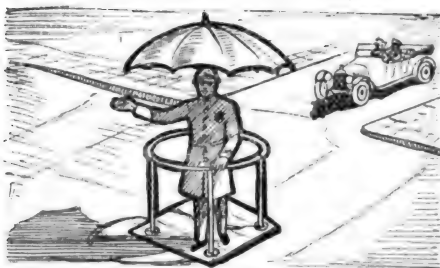
Oak Park, Ill., listens to the tunes from his phonograph as he glides along the highways. Through the use of a shock absorbing standard upon which the phonograph is carried, it is not affected by the road shocks and plays without missing a note.

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At a meeting of automobilists at Lancaster, Penn., the Lancaster County Good Roads Association was formed.

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The Motor Truck Dealers' Association of Los Angeles has asked the contest board of the A. A. A. to sanction another commercial car test which will be held on Oct. 21 and 22.



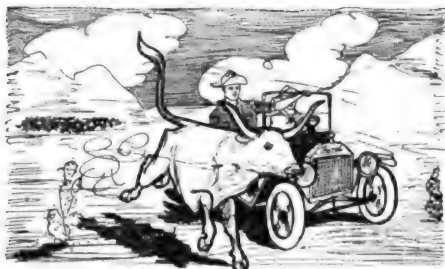
The members of the Automobile Club of Toledo, O., have gained the good graces of the traffic officers of that city by presenting each one with a wooden platform and canvas sunshade.

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A man with a dollar umbrella entering a restaurant will demand a lock and check for it, while he leaves a \$2000 automobile on some side street without any protection.

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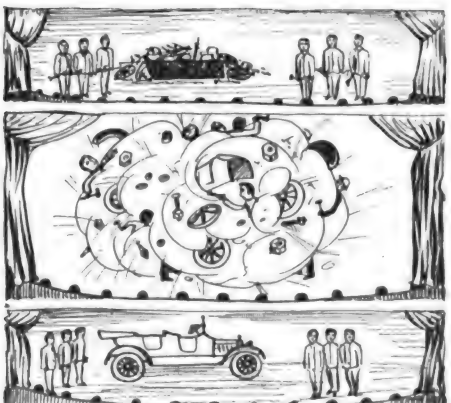
If the present tendency in the cattle country, where the Ford is usurping the place of the cow pony, continues, there is a possibility of an early exit of that picturesque character from frontier life. The cow punchers in New Mexico are now "bull-dogging" it from Fords instead of horses. This expression is used in ex-



pressing the sport of leaping onto a cow's neck and throwing it by the horns.

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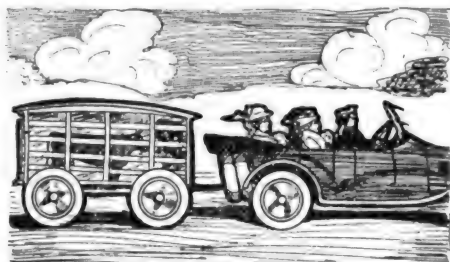
"The next act, gentlemen, will be, 'assembling the Ford,' by the Wrench brothers." This announcement may soon be heard on the vaudeville circuit as an act of that description has already been introduced in Connecticut and has made such a tremendous hit that it promises to become one of the top liners



on the programmes. At Hartford six mechanics recently assembled the parts of a Ford into a complete machine, ready to drive, in two minutes and 54 seconds.

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Carrying along a cow to supply drinkables while en route on a transcontinental tour is the latest development in "de luxe" touring. In this case, twins were born while the party of eastern motorists were in Colorado and the mother, fearing to change the milk diet, when leaving for home purchased the Jersey cow that supplied the milk and



took it eastward in a trailer attached to the rear of the automobile.

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In Switzerland the automobile industry has been growing faster proportionately than in the United States.

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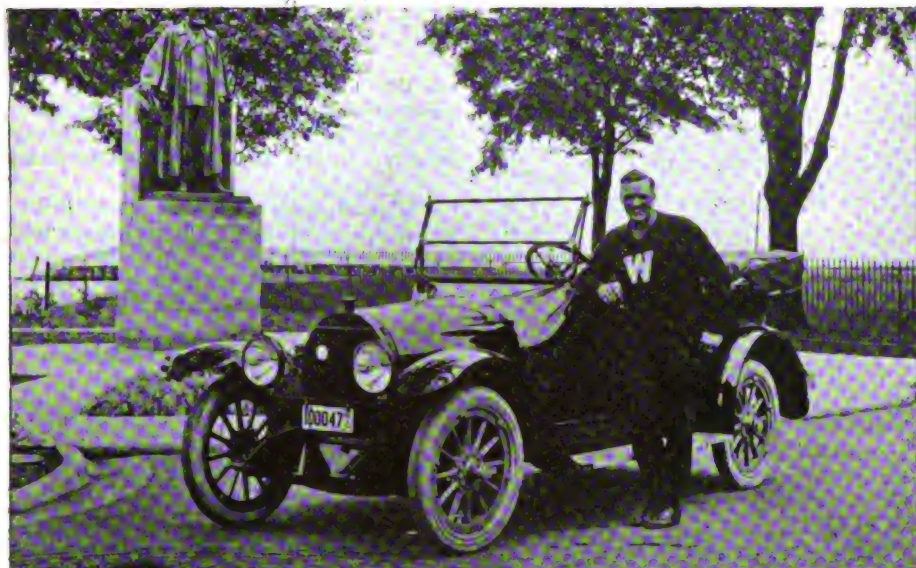
Ticdouloureux, or nervous trouble akin to the than disease, is an affliction to which dogs are subject if they ride much in motor cars, according to supposedly competent authorities. In a swift moving car a dog is keyed up to a high nervous tension by the flying panorama of people and inanimate objects, which causes an unhealthy action on the heart through strain on the optic nerve and brain.

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"The chariots shall rage in the

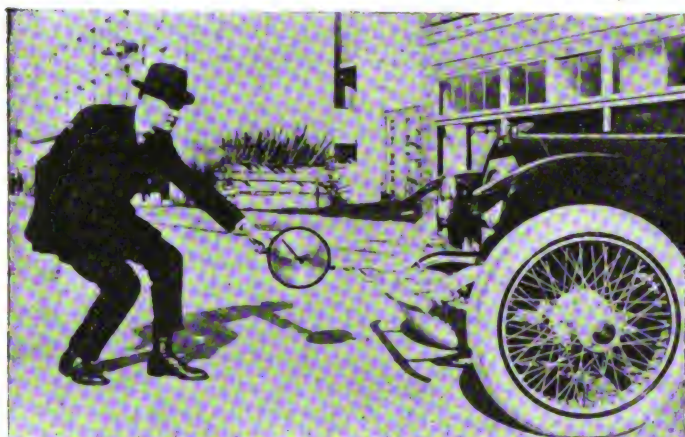


streets; they shall jostle one against another in the broad way; they shall seem like torches; they shall run like the lightnings." This quotation from the Bible, which is the literal translation of the description of the vision seen in a dream by Nahum, a prophet who lived in the land of Elkosh about 713 B. C., was the first prediction of the advent of the automobile, according to Dr. Charles L. Page of the Dudley Street Church, Boston, Mass. The age of automobiles was thus predicted by the Elkosh prophet centuries before man's ingenuity brought out the materialization of his dream.



Arlie Mucks, the Six Foot Five Inch University of Wisconsin Giant, Holder of World's Discus Throwing Record, to Whom Admiring Fellow Citizens of Oshkosh, Wis., Gave a Hundred Point Six KisselKar.

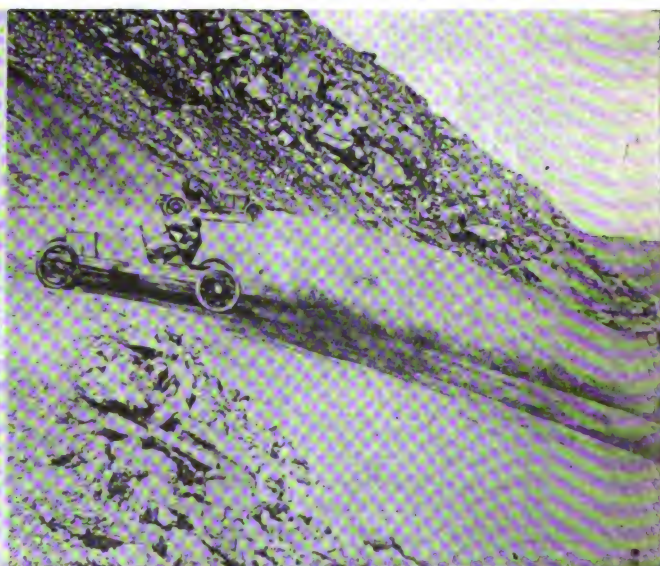
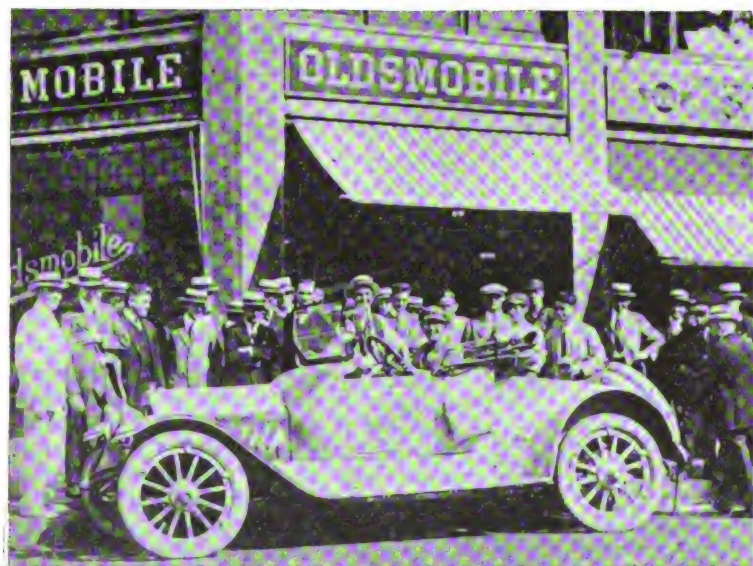
Camera Records of Pleasure Cars In Unusual Poses.



Demonstrating the Light Weight and Balance of the Overland Six by Pulling the Seven-Passenger Car Across a Street at a Maximum Exertion of Power of Only 52 Pounds.



Fleets of White Motor Buses Have Carried More Than 10,000 Passengers to the Summit of Pikes Peak Since the Road Was Officially Opened to Motorists on July 13, 1916.



Amanda Preuss of Sacramento, Cal., Who Claims the Transcontinental Record for Women, at the Conclusion of Her Recent Trip, Lasting 11 Days, Five Hours and 45 Minutes, Over the Lincoln Highway in Her Oldsmobile. At Right, a View of Fred Juntz, a Winner of a Recent Pikes Peak Race, Taking a Sharp Turn in a Chalmers at About 45 Miles Per Hour.

SUGGESTIONS FOR THE FORD CAR OWNER.

Construction of the Front Axle Unit, Steering Linkage and Wheels—Suggestions for Adjustments to Compensate Wear and Maintain Operating Efficiency.

The 66th article dealing with the operation, construction, maintenance, care and repair of the model T Ford chassis is the 17th of the series devoted to adjusting, restoration and overhauling.

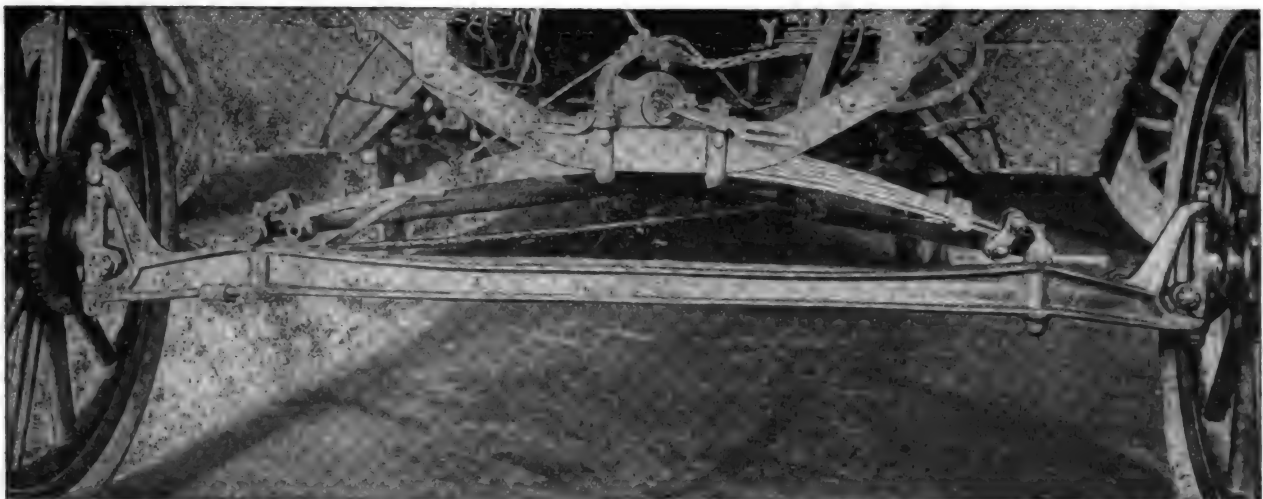
THE front axle of the Ford chassis is a single-piece steel drop forging that is I section, with yokes or forks at either end to carry the wheel spindles or knuckles and so formed that the greatest depth and thickness of the metal is near the yokes, there being bosses that extend the full depth and which are bored to take the shanks of the spring perches that carry the spring. The webs at the top and bottom of the I section afford a satisfactory degree of stiffness to the axle and reinforce it without adding materially to the weight.

The lower arms of the yokes are continuations of the axle forging and are short, but the

body is in shape of a T, the head of which is mounted with the ends between the yoke ends, and the shank is the spindle upon which the wheel is turned.

The Construction of the Spindles.

The spindle body is a steel drop forging that has a head practically uniform in diameter and the wheel spindle itself is formed to have a bearing seat close to the body, from which it tapers, the end of the spindle being threaded to take the nut that retains the outer bearing cone against the balls in the bearing race. The spindle body is bored for the spindle bolt or pivot and this is bushed at top and bottom with bronze bushings to compensate for wear, and the space between the bushings in the base forms a recess that will retain lubricant.



Front Axle of Ford Chassis, Showing the General Construction and the Mounting of the Spring and Frame, and Some of the Steering Gear Linkage.

upper arms rise almost at right angles and the ends are turned to parallel those of the lower arms. The yoke ends are expanded and are bored vertically to take the spindle bolts or pivots on which the axle spindles are mounted and on which they turn. These yoke ends are bushed with bronze that may be renewed in the event of wear. One will note that the form of the yokes is designed to resist the upward and end thrust upon the axle spindles.

The spindle bolts are fitted with oilers at the upper ends or heads, and are threaded at the lower ends so that they may be retained with castellated nuts and pins. When the spindle bolts are set tight the spindles swing on them, there being a movement of 15 degrees forward and back, or 30 degrees in all. One will note that the spindle

On the side of the spindle body, opposite and below the wheel spindle, is a heavy boss that is bored to take the spindle arm, which is separate drop forging. The spindle bodies are made rights and lefts because the spindle arms must project backward, which brings the steering linkage behind the axle to protect it against striking road or other obstructions. The spindle arms are shaped to curve slightly from the spindles toward the centre of the chassis and while all the ends are machined so that there are collars that seat against the spindle bodies, and are threaded to take nuts that retain them in the seats, the other ends are slightly expanded and flattened and bored for the bolts that pass through the yokes of the spindle connecting rod or tie rod. The bores of the ends of the spindle arms are bushed



The Steering Spindle or Knuckle: At Left, the Spindle Body, Spindle Arm and Connecting Rod Yoke, with the Spindle Bolt and One Bushing Removed from the Spindle and the Spindle Arm Bolt Partly Withdrawn; at Right, Spindle Arm, Bolt, Bushing and Nut Disassembled.

with bronze to allow restoration in the event of wear. The arms are made rights and lefts, and the right arms are bored about midway of the exposed length to take speedometer swivel joint supports, which are right angle shaped straight forgings, having one end threaded for the retaining nuts.

The Connecting or Tie Rod.

The spindle connecting rod is forged with a yoke at one end, and close to this yoke is a reinforcement that carries a globe that is part of a coupling with the steering gear connecting rod or drag link. The other end of the rod is threaded and on this is screwed a yoke that is adjustable by half turns to coincide with the position of the stationary yoke at the other end. This adjustable yoke is secured by a clamping bolt and lock nut. Bolts that are fitted with oilers and are retained by lock nuts pass through the yoke ends and the bushed ends of the spindle arms. The parallelism of the wheels is obtained by adjusting this rod. The connection between the two wheels depends upon the adjustment of this rod and the wheels ought to be precisely in line—that is, exactly the same distance apart when the measurement is made at the rim at the height of and in front of and behind the axle. The thread of the rod and yoke is so cut that a reasonably

close adjustment can be made. The clamping bolt is to insure against any change in length of the rod and afford a more positive control while steering.

The steering gear connecting rod or drag link is the connection between the spindle connecting rod or tie rod. It has at one end a socket that fits the globe or ball on the spindle connecting rod and which is fitted with a spring so that there is constant pressure upon the ball and there is no lost motion or rattle. At the other end is a ball socket that is formed of a flange forged on the rod and a cap that is secured by two bolts and locked nuts. Into this socket is placed the ball on the arm at the lower end of the steering column, by which the chassis is steered. This rod is not adjustable as to length, but wear can be compensated at the socket that encloses the ball on the arm of the steering column by draw filing the flanges of the socket and reducing the diameter of the socket.

The Front Radius Rod Construction.

The front axle is maintained in its relation with the frame by the radius rod, which in form resembles two legs of a triangle with a ball at the apex. The ends of the legs are shaped to have two spindles or shanks that are slightly bent so that these are at right angles to the axle. The



The Front Wheel Spindle and Its Fittings: At Left, the Steering Spindle and Wheel Spindle Mounted in the Axle Yoke, and Below It, from Left to Right, Are Shown the Stationary or Inner Bearing Cone, Inner Bearing Ball Race, Outer Bearing Ball Race, Outer Bearing Cone, Washer, Spindle Nut and Hub Cap; at Right, the Same Parts on the Spindle.

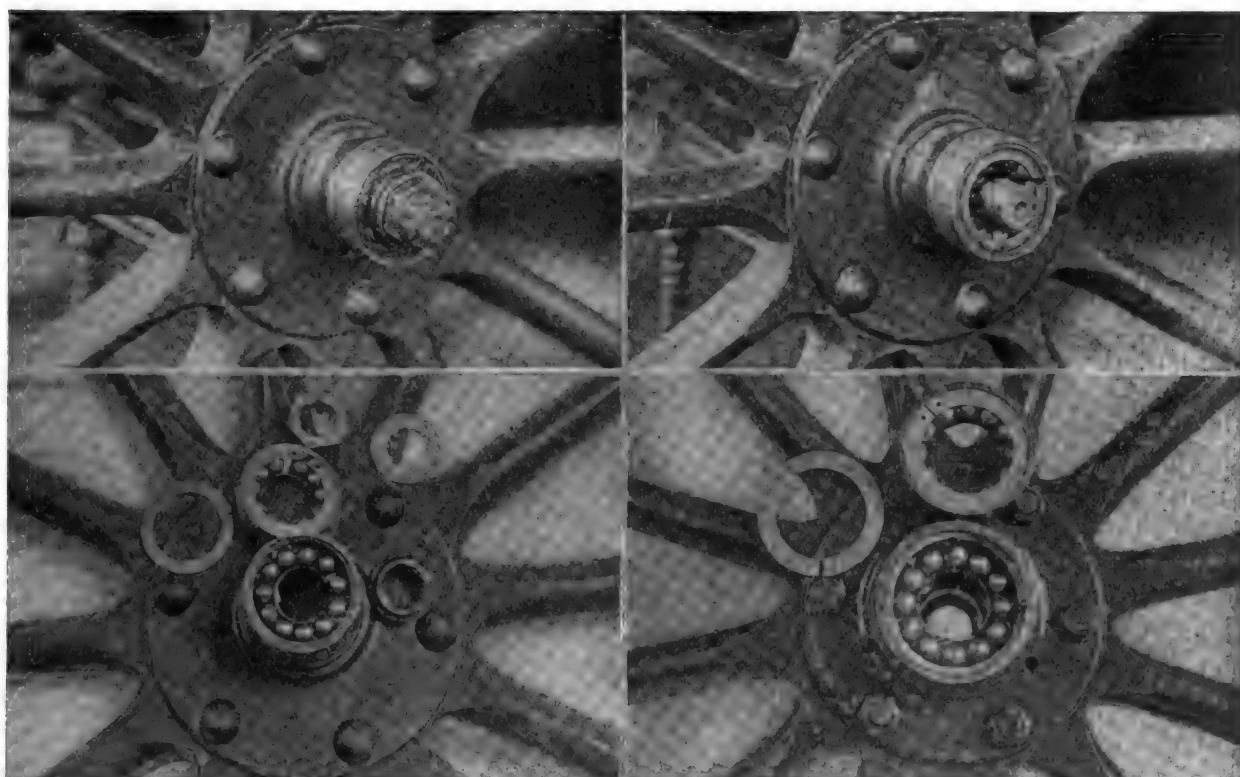
ends are machined so that there are collars or flanges that, when the ends are placed in bores in the spring perches, seat against the perches, and these ends are threaded and are secured in the perches by castellated nuts and pins. The ball at the apex of the rod is mounted in a socket that consists of two caps that are carried on two studs that are set into the flywheel housing of the base of the crank case, and the two springs on the studs and locked nuts maintain the two halves of the globe socket in close relation and prevent rattle. The socket can be adjusted to take up lost motion by draw filing the faces or flanges of the caps to reduce the diameter of the socket.

How the Wheels Are Mounted.

The wheels are mounted on the axle spindles in a very simple manner. On the wheel spindle,

rect relation is obtained the outer cone is locked by putting on the washer and seating the spindle nut against it and locking it with a split pin. When well adjusted the weight of the valve stem of the tire will cause the wheel to turn until the stem is at the lowest point. The bearings of the wheels should be kept well packed with grease. There should be no play of the wheel on the bearings, and if there is a clicking noise when the wheel is turned there is probability of a ball being broken.

As will be noted from the illustration the perches on which the front transverse spring is mounted are secured in the axle by castellated nuts and pins and the spring is carried under the ends of the perches on hangers that are two-piece construction, there being a side or shackle and a



The Front Wheel and Its Bearings: Upper Left, Hub Cap Removed; Upper Right, Spindle Nut, Washer and Cone Removed; Lower Left, Ball Retainer Removed, with Spindle Nut, Washer, Cone, Ball Retainer and a Complete Bearing Shown; Lower Right, the Ball Retainer Removed and a Complete Bearing Shown.

that is seated against the head or body, is a stationary cone. The hub of the wheel is so formed that the ends are seats for the ball bearings, which are the cup and cone type. The inner bearing is the larger, but in other details they are identical in construction. The races are pressed steel and are heat treated and ground. The inner or larger race will take 24 balls and the outer 22 balls, the balls of the outer bearing being the smaller in size. These balls are retained by spring rings. The rings can be easily placed or removed by springing them.

The ball races are seated in the hub and the adjustment is made by screwing on the outer cone, which brings the inner bearing against the stationary cone on the spindle. When the cor-

bolt forged together, with the ends of the bolts threaded to take castellated nuts. The bolt or threaded parts are passed through the eyes of the springs and the perches and when the nuts are tightened form solid rectangular supports for the springs. The spring hangers are fitted with oilers so that the bolts may be lubricated. The eyes of the spring perches are bushed so that they can be very easily restored when worn.

In making repair or overhauling the front axle the main object should be to eliminate all lost motion that may result from wear, and to make the unit free from rattle. The condition of the wheels ought to be observed carefully, for they should have the exact relations designed for them.

(To Be Continued.)

INDUSTRIAL NEWS AND NOTES.

Reo Companies to Unite; Big Earnings for Stutz; Overland Expanding; Klaxon Absorbed.

A combination of the Reo Motor Truck Company and the Reo Motor Car Company is to be effected in the near future by the exchange on an equal basis of the shares of the two concerns. The interests of the two companies being largely identical, it was decided that a more efficient organization and more economical operation could be obtained by a consolidation.

The Reo Motor Car Company sent out a notice that it would purchase all the stock of the Reo Motor Truck Company delivered to the Capital National Bank at Lansing, Mich., or to the secretary of the Reo Motor Car Company, D. E. Bates, on or before Sept. 20, paying for the stock in shares of the Reo Motor Car Company.

In anticipation of a further expansion in the company's plants the Reo Motor Car Company has purchased a site of land covering three city blocks, which, together with its other holdings, gives it control of over half a mile of land extending along the tracks of the Grand Trunk railroad.

KLAXON IN UNITED MOTORS.

The Lovell-McConnell Manufacturing Company of Newark, N. J., manufacturer of the Klaxon horn, has been purchased by the United Motors Corporation and will be made one of the subsidiaries of the latter concern, together with the five other companies already merged, the Perlman Rim Corporation, Remy Electric Company, New Departure Manufacturing Company, Hyatt Roller Bearing Company and the Dayton Engineering Laboratories Company.

The name of the latest acquisition of the United Motors has been changed to Klaxon Company and the concern's productive capacity will be immediately doubled to care for the enormously increased business which has been recently acquired. One of the concern's largest contracts is with the Willys-Overland Company, to run for a term of years, and term contracts have also been made for the exclusive use of this horn on all cars manufactured by the Buick, Cadillac, Oldsmobile, Oakland, Scripps-Booth and Chevrolet companies.

OVERLAND COMPANY EXPANDING.

The Willys-Overland Company of Toledo, O., is expending \$5,000,000 for construction and additional equipment to increase the productive capacity of the plant to 300,000 cars annually by the first of the year.

When these increased facilities have been installed and in operation it is understood that the concern's policy of expansion will have been consummated,

and efforts of the management will be confined to reducing costs and increasing the efficiency of the organization.

The concern is now the second largest in the manufacture of automobiles in the world and when payment is made into the treasury for the 600,000 shares of common stock that was recently placed on the market the company will have over \$20,000,000 cash on hand.

HARROUN MOTORS CORPORATION.

The Harroun Motor Corporation has been incorporated under the laws of Delaware, with a capitalization of \$10,000,000, to manufacture the car that has been in the process of development under the direction of Ray Harroun, the racing driver, for the past two years. The first of the Harroun cars, which will sell for \$595, has been completed and 10 more will be ready for exhibition at the shows in January.

It is expected that the company will be manufacturing the cars in quantities sufficient to supply dealers by March, 1917, and according to present plans, will produce 25,000 cars between that time and May 1, 1918. The cars have a 107-inch wheelbase and the motor is a four-cylinder, valve-in-head type. A particular feature is in the method of construction, which will call for a large number of pressed steel parts. It is understood that a plant will be located in Michigan.

John Guy Monihan, formerly with the Premier Company, is president of the company. Ward Macy is to be sales manager and Paul Bruske will be in charge of the advertising.

TAXAMETER RAISES CAPITAL.

The stockholders of the International Taxameter Company of America at a recent meeting voted to increase the common stock of the company from 2500 shares of a par value of \$100 each to 50,000 shares at \$10 par value each, making the total capitalization \$500,000.

KEYSTONE RUBBER AND TIRE CO.

The Keystone Rubber and Tire Company of Pittsburg, Penn., has been incorporated and a large plant is being erected at Penn station, a suburb of Pittsburg, where automobile tires will be manufactured. The Keystone tire will be manufactured by a secret process. It is said to be puncture proof and will carry a guarantee of 20,000 miles. It is expected that the new plant, a three-story structure, 190x160 feet, will be completed within 60 days and that production will commence within 90 days. About 600 hands will be employed.

All the capital stock of the concern is held by the promoters of the company and officials. C. C. Goelitz is president; M. R. Haymaker, vice president; R. S. Robb, treasurer, and they and the following make up the directorate: Cornelius D. Scully, John D. Graham, Max J. Spann and John A. Sharpe.

STUTZ EARNINGS.

The Stutz Motor Car Company of America made net profits of \$267,982 during the first five months of this fiscal year. Net sales during that period totaled \$1,319,107, and the operating and expense cost was \$1,031,676. An item of \$36,122 for selling and general expenses was deducted from the gross profits remaining, and a special item of \$16,725 of other income was in turn added, bringing the net to the figure quoted. The stock of the company has been listed on the New York Stock Exchange.

DE PALMA BUYS FACTORY.

Ralph De Palma and Frank Book, the latter of Detroit, recently organized the De Palma Manufacturing Company, to build racing automobiles in the city of Detroit, and have acquired a factory on East Woodbridge street, at a cost of \$23,000. De Palma, who is a veteran racing driver, will supervise the construction of the product.

New Financing For Fiske Co.

Stockholders to Vote on Increase of Capital—Full Details of the Plan.

A meeting of the stockholders of the Fiske Rubber Company has been called for Oct. 2 to act upon a proposed increase of capitalization. The vote will be on an increase in capital of \$12,500,000 or less, of which \$7,500,000 or less is to be first preferred convertible stock and \$5,000,000 or less second preferred stock. A vote will also be taken on an increase of the authorized common stock by an amount necessary to take care of the conversions of the existing second preferred and the proposed first and second preferred. The stockholders will also be asked to authorize the reduction of the authorized capital of the company by \$5,000,000, being the amount of second preferred, series B, authorized a few months ago, but not issued.

The new first preferred, prior to Jan. 1, 1922, may be converted into common at 125, at the rate of four common to five preferred, and from Jan 1, 1922 to Dec. 31, 1926, at 150 at the rate of four for six. The \$2,000,000 second preferred is now convertible into common stock up to Nov. 1, 1917. It is proposed to extend this period, if the stockholders approve, to Nov. 1, 1923. The new second preferred will be identical in terms with the second preferred outstanding.

It is proposed to offer pro rata to holders of the present first preferred \$5,000,000 of the new first convertible preferred stock at par and accrued dividends. Of the \$5,000,000 or less proposed increase in the second preferred, half will be offered pro rata to holders of the present second preferred and common at par and accrued dividends, giving each the right to subscribe for one new share for each four held.

ORGANIZE PATENTS COMPANY.

The Cook Attachment Patents, Inc., organized in New York state, with a capital of \$10,000, for the purpose of issuing licenses under the Cook patents, will also work to develop and amalgamate the truck attachment business.

The Cook patent, which is now in litigation in the courts at Chicago, is claimed to be the basic patent covering truck making attachments. The Redden Motor Truck Company is the licensee under these patents and it is stated that six manufacturers of similar attachments have already discussed arrangements with Mr. Redden for manufacturing under the Cook patents.

Mark W. Norman, a New York attorney, is president and treasurer of the new company and B. H. Barber secretary.

New Capital In Victor Motor.

New Company Incorporated with Capital of \$2,000,000 and Factory Site Purchased.

The Victor Motor Company is planning the erection of a plant at Grubbs Ferry, Md., with facilities for the manufacture of 50,000 automobiles annually. This announcement was made with the purchase of a site of 12 acres, five of which will be used for the factory site and the other seven for the erection of office, buildings and homes for the employees. Ground will be broken at once. The site is located about four miles north of Wilmington on the Delaware river.

The Victor Motor Company, which was incorporated under the laws of Delaware on Aug. 16, with an authorized capital of \$2,000,000, acquired the business of the Victor Car Company of Philadelphia, which has been building automobiles for a number of years.

It is understood that the new concern will manufacture a new model moderate priced car. The executive offices of the company will remain at 1530 Chestnut street, Philadelphia.

The officers of the company are: Charles B. Granfield, president; C. Victor Stahl, vice president; H. H. Skerrett, treasurer; Reginald Johnson, secretary. The board of officers, together with William H. Bischoff, will form the directorate.

SAXON INCREASES DIVIDEND.

Net Earnings for Fiscal Year Are Over \$1,300,000, or More Than 20 Per Cent.

The dividend declared by the Saxon Motor Car Corporation of 1½ per cent., payable Oct. 2 to stockholders of record Sept. 29, shows an increase of one-quarter of one per cent. as compared with the last previous dividend of 1½ per cent., which was paid in July.

The first annual report of the company covers operations up to June 30 of this year and shows net earnings of \$1,316,273, or over 20 per cent. on the \$6,000,000 capital stock. Current assets at the close of the fiscal year were \$3,123,879, as compared with current liabilities of \$907,222, leaving a surplus of working capital of \$2,216,657. The balance sheet for the year is as follows:

Assets.	
Plant and equipment.....	\$73,914
Investments	7,500
Cash	596,722
Notes and accounts receivable..	392,830
Inventory	2,134,327
Deferred charges	18,143
Good will, models, patents.....	4,557,229
Liabilities.	
Capital stock	\$6,000,000
Notes and accounts payable.....	907,222
Surplus, profits for eight months, from Nov. 1, 1915	\$963,443
Less dividend.....	90,000
	873,443

During the year 25,399 cars were manufactured as compared with 12,099 cars during the year ending June 30, 1915. It is expected that the production for the ensuing year will be 40,000 cars.

FIRESTONE TO INCREASE.

At a meeting of stockholders of the Firestone Tire and Rubber Company of Akron, O., to be held Sept. 30, a vote will be taken on a proposition to increase the capital stock from \$4,000,000 to \$50,000,000. Of this issue \$40,000,000 will be common and \$10,000,000 preferred stock. Under the proposed plan the present \$1,000,000 preferred stock probably will be redeemed at 110. A big stock dividend in the nature of an exchange of six or seven shares of new stock for one of old is looked for and it is expected that if a stock dividend is declared the common will be put upon a five per cent. basis.

The Firestone company has been enjoying an enormous business during the past year, as indicated by estimates made in July of the yearly earnings, showing a gross of \$35,000,000 for the year or an increase of nearly 40 per cent. over a year ago.

FORD EMPLOYEES GET BONUS.

An "expression of good will," as it was termed by the directors of the Ford Motor Company, was given to the 1399 foremen and department heads of that com-

pany in the form of a bonus, totaling \$850,000. This melon, which was in the past distributed at Christmas time, was given out Wednesday, Sept. 13, as a reward for service and results obtained throughout the year. Owing to the change in the fiscal year of the company from Oct. 31 to July 31, the bonus was divided earlier this year. The amounts of the individual bonuses ranged from \$100 to \$1000, and were distributed mostly among men in the main shops, only 100 in the main office participating and 231 in the branch offices.

ALLEN MOTOR COMPANY DIVIDEND.

A dividend of 31 per cent., of which 25 per cent. is in stock, has been declared by the Allen Motor Company of Fostoria, O. The remaining six per cent. was paid in cash. A report was made to the directors of the company that orders for 15,000 cars would be booked by the first of the year.

KELLY-SPRINGFIELD TO MOVE.

The Kelly-Springfield Tire Company of Springfield, O., will move its plant in the near future to Cumberland, Md., where a new factory will be erected with sufficient room and facilities to triple the company's production. The officials of the city of Cumberland offered a free site and a bonus of \$750,000 if the company would move to that city. The negotiations have not been closed as yet, but reports emanating from reliable sources state that there is little doubt but what the offer will be accepted, as in their present location they are both cramped for room and housing facilities for the help.

John W. Ruse died at Kenosha, Wis., on Sept. 15 of heart failure. Mr. Ruse was well known in the automobile industry, having been connected with the Buick organization for eight years and recently with the Nash Motors, manufacturers of Jeffery cars and trucks.

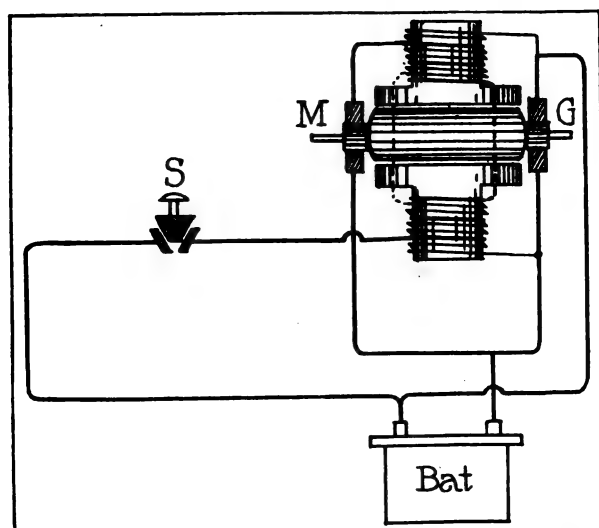
PAIGE MAKES RECORD.

The Paige-Detroit Motor Car Company shipped \$2,020,200 worth of Paige cars in August, eclipsing all previous records in the history of the concern. These shipments, however, do not correctly reflect the volume of Paige orders, as 1982 cars had to be held over into September, indicating that the August record will not stand very long. The demand for Paige sixes keeps constantly increasing and the factory organization is steadily adjusting itself to cope with the increased production which has been made necessary.

MOTOR STARTING AND CAR LIGHTING.

How the Capacity of the Battery Is Diminished by Rapid Discharging and the Need of Full Restoration by Charging—The Possibilities for Rebuilding Cells.

BATTERY capacity is based on the eight-hour rates, that is, when it is charged and discharged for eight hours, which period has been found by experience to afford the best results and the greatest efficiency, and by ampere hours rating. By this is meant that a battery that has a rating of 100 amperes, for instance, will give theoretically 100 ampere for one hour or one ampere for 100 hours, but the nearest approach to 100 amperes will be given when the battery is charged in eight hours and discharged in eight hours. Or, to put it another way, the discharge ought not to exceed one-eighth of the ampere-hour capacity of the battery, which would be $12\frac{1}{2}$ amperes approximately for a battery of the size specified.



Compound-Wound Single Unit Generator and Motor. The Shunt Winding Field Making Circuit with the Generator Brushes Affords Conventional Shunt-Wound Generator Action for Generating; the Motor Commutator Brushes and the Series Field Winding Are Placed in Circuit When the Switch Is Closed.

Charging faster than the indicated rate will mean an excessive use of current, unnecessary gassing and dissipation of the electrolyte with no good result. A battery can be charged at a much higher rate than is indicated until gassing begins, and then it should be discontinued or the amperage should be reduced, for the temperature will be increased and the greater activity will be more or less destructive. When a given work is to be obtained from a battery from 25 to 40 per cent. more energy should be put into it by charging than can be obtained by discharging because of the differing reasons for loss.

When a battery is discharging rapidly there is a very certain and positive loss that may be meas-

ured by the following approximate figures, which are taken from normally efficient cells, and which probably are higher than might be expected from batteries that had not been well maintained:

Hours Dis-charge	Per Cent. Efficiency	Hours Discharge	Per Cent. Efficiency	Hours Discharge	Per Cent. Efficiency
8	100	5	89	2	65
7	97	4	83	1.5	57.5
6	93.5	3	75	1	50

Assuming that the charge had been made in eight hours and the discharge was in one hour, there will be a loss of 50 per cent. without considering other factors that might influence capacity, and this is attributed to the fact that the acid radical in plates is not reduced and still remains in the pores. As has been stated, the plates will expand when the battery is discharging and the rapid expansion is very destructive. Rapid discharge is not accompanied by marked increase of temperature, and there is no material change unless the discharge is continued for a considerable period. But there is an appreciable increase of the discharge voltage if the temperature of the electrolyte rises.

When the battery is being charged there is a decrease of voltage as the temperature rises, and this has been proven to be as much as .18 volt in the increase of temperature from 57 to 113 Fahrenheit, and the greatest loss was .12 volt between 57 and 86 degrees of temperature. There is another aspect, and that is that the ampere and watt hour efficiencies will decrease with the rise of temperature.

Why there is increased capacity of the plates and greater discharge capacity when the temperature is higher is from the fact that the porosity of the plates is at maximum and there is a greater degree of permeability. The efficiency of the battery plates is based on the charging rate, the discharging rate, the internal resistance, the volume, density and diffusion of the electrolyte, the period of time between the end of discharging and the beginning of charging, the absence of local action and the temperature. The results may be expressed in the ratio of the useful current discharged, the standard being the current required for charging, and in a similar manner the ampere hour and the watt hour efficiency may be expressed.

The loss from resistance is not an extremely important factor, but it will vary from two to five per cent. on discharge, being lowest at the beginning of discharging and highest at the end, and being highest at the beginning and lowest at

the end of the period of charging.

Now as to the matter of quick discharging, which is necessary when the engine is started. When the starting switch is pressed and the battery is connected with the motor all of the amperage pressure is impressed upon the circuit, and this may be and very often is from 300 to 400 amperes, which pressure is reduced as the motor absorbs the current and decreases until it is merely sufficient to turn the engine. This is a very great demand and is in every way contrary to the operating rule that has been stated.

Because of the necessity of having batteries that will deliver this large amperage the plates are made thin and have maximum area exposed to the electrolyte, and they cannot endure unless they are given every care that should be given, especially with reference to maintaining the height of the solution in them, and certainly they cannot deliver energy unless they are charged.

All batteries are built with one more negative plate than there are positive plates, and the positive plates are shorter lived than are the negative. Generally speaking the life of the negative is approximately twice that of the positive plates and no degree of attention will change this condition. There is possibility of rebuilding batteries and utilizing the elements aside from the positive plates and the plate separators, which will be more or less of a saving, but obviously this cannot be done save by an expert, for the work must be done with care and accuracy and then the cells must be brought to the highest degree of capacity by close observation and systematic charging.

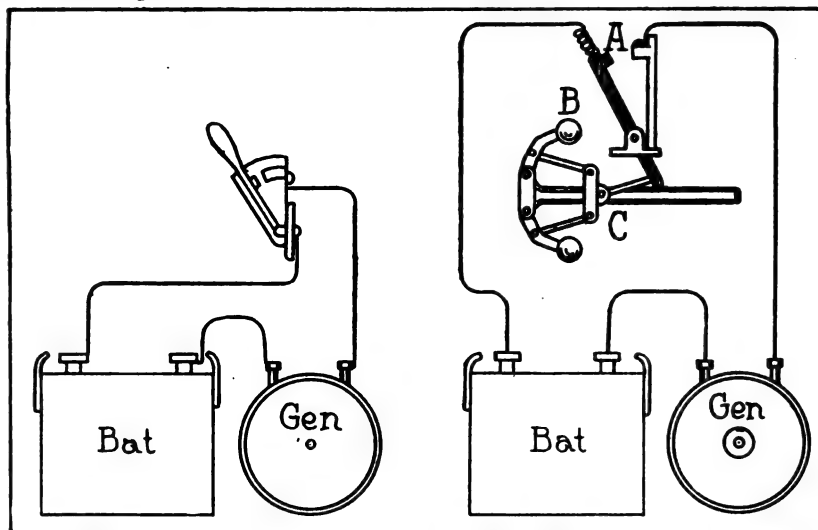
There are general principles that are followed in the construction of all batteries and while there may be variance as to the constituents of the plates, the assemblies closely resemble each other. Practically all the plates used in batteries used for starting and lighting are the Faure or pasted type, in which the active material is mixed in a plastic mass and forced into grids or frames in which it solidifies. The plates are then hard and have the appearance and feeling of metal. The plates are formed by subjecting them to electric current that converts them into positive and negative. The intended use has much to do with the construction.

The plates are assembled with a positive plate between each negative plate, and between the plates are separators, usually a thin sheet of hard rubber perforated with fine holes against each positive plate and a thicker sheet of wood with longitudinal channels between the rubber sheet

and the negative plate. The purpose of the rubber sheet is to prevent the active material of the positive plate from being dislodged by the circulation of the electrolyte, and the channels of the wood separator is to afford certain contact of the electrolyte and insure activity of negative plate.

The wood separators are chemically treated to eliminate from the wood all acids and insure that they are permeable. The separators extend to the bottoms of the plates and about $\frac{3}{8}$ inch above them to prevent substances accumulating on the surface of the electrolyte "bridging" and short circuiting the plates. The action of the solution on the separators caused deterioration and for this reason they are generally renewed when cells are rebuilt.

Unless the straps and connectors are burned (the lead fused so that it is one solid piece) there is possibility of corrosion, which might insulate the parts and interrupt the circuits, and lead-burning is not work that the inexperienced should undertake. Then when the cells are given the



Hand and Automatic Governed Cut-Outs: Hand Operated Cut-Out a Positive Switch; Centrifugal Type Governor, A, Contacts of Cut-Out; B, Weights of Governor; C, Block Operating the Lever That Actuates the Weights

forming charges careful record is necessary, and this can never be well done save by the expert, for cells require different treatment to meet varying conditions which would not be evident unless one has had training in this work.

Engineers who have studied the batteries used for lighting and starting are practically unanimous in the statement that fully 90 per cent. of the failures of batteries is resultant from two causes—neglect that has exposed the plates to the action of the atmosphere, because the dissipated water had not been replenished, and undercharging. Undercharging does not necessarily mean that the generator was not operative, because this would have been noticeable in the lamps, but undercharging with reference to the excessive drain upon the batteries from starting the engine.

(To Be Continued.)

ACTIVITIES OF PROMINENT MEN IN THE INDUSTRY.

News Concerning Well Known Members of the Motor Vehicle and Allied Industries.

FRIEND HEADS MITCHELL.

Otis C. Friend has been elected president and general manager of the Mitchell Motors Company, Inc., of Racine, Wis., to succeed H. L. McClaren, who recently resigned. This announcement came very unexpectedly in the automobile industry, as Mr. Friend, less than three months ago, resigned his position as general sales manager of the Mitchell company to become vice president and general manager of the United Motors Corporation of New York.

Mr. Friend has climbed every rung in the ladder of the Mitchell organization, having first been connected with the concern in 1904 as a salesman with the Chicago agency. He later became a dealer and was purchasing agent, factory manager, advertising manager and sales manager of the Mitchell company.

John W. Bate, vice president, chief engineer and factory manager, remains with the Mitchell company, as do W. H. Armstrong as secretary and treasurer, and F. L. Mitchell as comptroller.

TAYLOR WITH EVAPCO COMPANY.

Kirk Taylor, formerly with the New Era Spring and Specialty Company, has become sales and advertising manager of the Evapco Manufacturing Company, Detroit, Mich. Mr. Taylor will also have charge of the advertising of the Jiffy Starter Company, which is an associated concern.

Two products, the Evapco gas saver, which sells for \$5, and White's oil distributor for Fords, are being marketed by the Evapco company, which is confining its sales to jobbers. The Jiffy starter



Kirk Taylor, Evapco Manufacturing Company.

for Fords, which is being manufactured by the Jiffy Starter Company, sells for \$10. This device is being used on Fords throughout the country and has given excellent satisfaction.

L. H. BILL LEAVES NASH.

Louis H. Bill, general manager of the Thomas B. Jeffery Company of Kenosha, Wis., which has become the Nash Motors Company, has resigned his position and Jerry De Cou, who has been factory manager for a number of years, has also tendered his resignation. Mr. Bill, who leaves for his home in California on Oct. 1, has been with the Jeffery people for over 12 years and Mr. De Cou has been connected with the company for a longer period.

NEW GRAMM-BERNSTEIN COMPANY.

The Gramm-Bernstein Motor Truck Company, an Ohio corporation, has been organized with \$4,000,000 capitalization to take over the Gramm-Bernstein Company of Lima, O., manufacturers of the trucks of that name.

The capital of the new company is divided into \$3,000,000 of common stock and \$1,000,000 of preferred stock, and the par value of both classes is \$10 a share. The officers are: M. Bernstein, president and treasurer; B. A. Gramm, vice president and general manager; H. O. Bentley, secretary and legal adviser; R. H. Spear, director of sales.

In one section of England it is reported that operators of motor trucks are obliged to equip their machines with "hooters" that automatically sound when the speed of the machine exceeds 12 miles an hour.

Resignations, Promotions and Other Changes in Personnel Recently Announced.

LOZIER PLANT SOLD.

The plant of the Lozier Motor Company of Detroit has been sold to the Motor Products Corporation for approximately \$750,000. The latter concern will continue to maintain its plant at Ann Arbor, which is conducted under the name of the Superior Manufacturing Company, but its main operations will be concentrated in the Lozier plant, the plants of the constituent companies, the Diamond, Rands, Vanguard and the Universal Metal companies having been disposed of.

CHARLES J. BOUR.

Charles J. Bour, president of the Bour-Davis Motor Car Company of Detroit, Mich., has resigned his active business associations in Chicago to devote his entire attention to the manufacture of the Bour-Davis car. For 25 years Mr. Bour has been in the advertising business and has a national reputation in that line. He is a director and vice president of the Chicago, Duluth and Georgian Bay Transit Company, operating the steamers North America and South America, and also a director and vice president of the Illinois Kaolin Company.

Old Lena, the Pathfinder four-cylinder car which has made 11 transcontinental trips, was on exhibition at the Indianapolis automobile show, where it attracted widespread interest. Old Lena has covered over a quarter of a million miles on official business and is still in excellent running condition.



Otis C. Friend, New President of Mitchell Motors.



Charles J. Bour, President of the Bour-Davis Company.

INSURANCE RATES INCREASED.

Western Association Advances Rates In Illinois Because of Large Number of Thefts.

Owing to the fact that there has been a marked increase in the number of automobile thefts in Chicago recently, the Western Automobile Underwriters have advanced the insurance rates against theft throughout Cook county, Ill. Because so few of the stolen cars were recovered the rate there for full coverage was increased as follows: On 1916 and 1917 models the rate on cars valued at from \$2100 to \$3499 was advanced from \$1.75 to \$2.00; on cars valued at from \$1200 to \$2099, from \$2 to \$3 on cars valued at from \$700 to \$1199, from \$2.25 to \$3.50; on cars valued at from \$699 and under from \$2.75 to \$5.

Since the beginning of the present year 591 insured automobiles have been stolen in Chicago and not recovered. The great majority of these were low priced cars, which the thieves take in preference to the higher priced machines, as it is easier to destroy their identity and they can be disposed of more readily.

A much larger number than that mentioned were stolen and not recovered, but as they were not insured the Automobile Protective and Information Bureau of Chicago, which traces stolen machines for the insurance organization, kept no record of them.

PATHFINDER TWELVE.

S. C. Hetherington and J. E. Williams of the Hetherington Motor Company, Pathfinder dealers in Philadelphia, Penn., drove a Pathfinder Twelve, which was sealed in high gear and reverse, from Indianapolis to Philadelphia in two days, averaging 28 miles an hour during the trip. An average of 11 miles to a gallon of gasoline was made.

WILL HOLD CLOSED CAR SHOW.

The Omaha Automobile Show Association, Omaha, Neb., will hold a closed car salon during the latter part of October. A number of unique features will be incorporated in the exhibition and it is expected that it will attract widespread attention not only as a novelty, but on account of the class of exhibits. The exhibition space will be the central aisle of a large Omaha department store, which is the longest in the country. In this way an excellent setting will be obtained and thousands will have the opportunity of learning the advantages of closed bodies.

NOVEL COAST DEFENSE PLAN.

Earl G. Gunn, chief engineer of the Premier Motor Corporation of Indianapolis, is the sponsor of a novel coast defense plan which involves the organiza-

tion of a coastwise mobile artillery corps, equipped with heavy guns operated on cement runways or roads extending along the coasts.

"It would be perfectly possible," he says, "to put on these roads a sufficient number of high powered, long range guns to render our coast impregnable. The guns could be mounted on huge portable carriages and the motive power for these carriages could be a squadron of gasoline or kerosene operated tractors. This plan would imply the creation of a strong coastwise flying division to do the scouting and to direct the placing the guns. Our navy would, of course, continue to be our first line of defense. The coastwise artillery corps would be our second line of defense. As it stands now we have no second line of defense."

"THE DIXIE HIGHWAY."

"The Dixie Highway," the official publication of the Dixie Highway Association, has become a monthly publication, instead of fortnightly, and is issued in magazine form instead of its former style.

The September number contains two very interesting historic articles, one entitled "On Historic Ground," written by W. A. Brownfield. Another is "Through Sunny Tennessee," by Prof. A. J. Brandon. Both stories deal with sections along the highway.

LYNITE ALUMINUM IN MARMON.

The Lynite aluminum pistons used in the Marmon cars have been subjected to the severest kinds of tests since their adoption and have not as yet been the basis or cause of a complaint. They combine strength and lightness and have given excellent satisfaction in long tours over every condition of roadway, which is the best proof of the serviceability of any mechanical part of a motor car.

NEW AUTOMOBILE BOOK.

"Automobile Driving and Repairing," a new motor hand book, written and compiled by Morris A. Hall and George W. Cravens, and published by the American Technical Society of Chicago, Ill., is a valuable compendium of information for either the man who has just purchased his first car or for one who has been driving for years. It contains much reliable data and many suggestions that will prove of great value to the automobilists, saving him time, money and trouble.

Mr. Hall is a man of long experience in handling information about the construction and repair of automobiles and

treats his subjects in a way that makes them easily understood by even the novice in mechanical matters. The volume, which is bound in black leather, is profusely illustrated with cuts and diagrams.

ROAD BULLETIN.

The United States Department of Agriculture has issued a bulletin on "Public Road Mileage and Revenues in the Middle Atlantic States, 1914," which gives the mileage of improved and unimproved roads, sources and amounts of road revenues, bonds issued and outstanding, and a description of the systems of road administration and fiscal management and of other factors affecting road improvements in each of the states.

"GRAPHITE."

"Graphite," the monthly publication of the Joseph Dixon Crucible Company of Jersey City, N. J., is an exceptionally interesting number, containing many items of information on lubrication, as well as little paragraphs of a highly entertaining nature. It is sent free upon application.

REDRESS FOR MUD SPATTERING.

One of the courts in Massachusetts recently handed down a decision giving damages to a plaintiff for injury done her dress by having mud spattered upon it by an automobile wheel. The court held that the driver owed a duty to pedestrians and should operate so as to avoid not only injury to the person from violence, but to the clothes from spatter, and that in determining the proper speed of the car the muddy state of the street is a circumstance to be considered as well as other traffic conditions.

The general impression has been among motorists that pedestrians had no redress in case their clothes were damaged by spattered mud from a motor car wheel.

BRICK ROADS.

The Office of Public Roads and Rural Engineering of the United States Department of Agriculture has issued a 40-page pamphlet on "Brick Roads," written by Vernon M. Peirce, chief of consultation, and Charles H. Moorefield, senior highway engineer. The publication gives an exhaustive description of the proper methods of constructing brick roads, together with formulas for preparing the bricks and other material used. It is quite an exhaustive treatise and gives illustrations of both brick roads constructed under the modern methods and the older methods that did not prove successful.

A new club house for the Automobile Club of Canada is to be erected at Montreal. It will be located in the centre of the city and have garages, work shops and other equipment.



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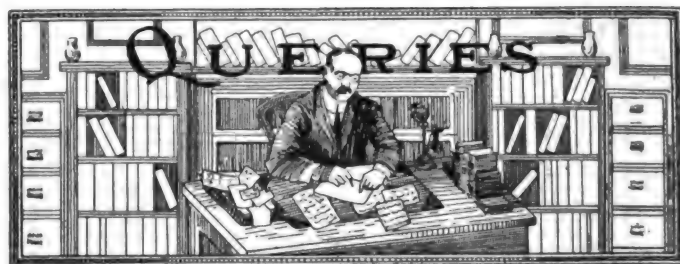
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**PUMP LEAKS.**

(W. W. S., Palm Beach, Fla.)

Kindly recommend through your valuable columns some substance that can be applied to a leather washer of a tire pump so it will not allow the air to filter through and thus cause loss of time.

It is doubtful if the air filters through the leather washer, rather it is likely that the washer is a poor fit. However, if the washer does fit snugly and yet leaks it is possible that a little neat's foot oil or castor oil applied to the washer will remedy the trouble. If it does not it would be advisable to install a new washer.

TUBES VS. SHOES.

(E. N. H., Atlanta, Ga.)

Will you kindly favor me with an opinion as to which of the two combinations of tube and shoe is to be preferred as a safeguard against blowouts? Good tubes in fair shoes or fair tubes in good shoes.

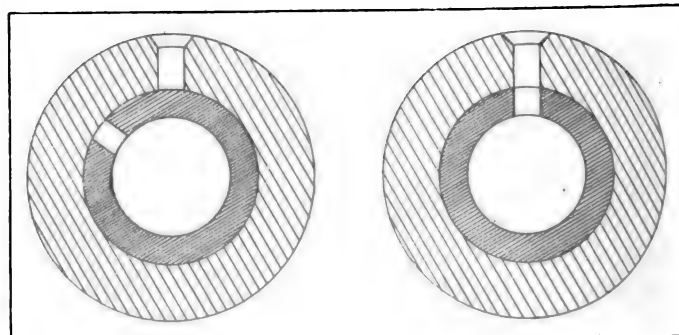
While there is no absolute safeguard against blowouts, one can guard against them by having the tires inflated to full pressure at all times and by having any cut or weak place in the shoe immediately fixed. In regard to the opinion you ask, it would seem the best policy to have good shoes, as in that case the tubes would be less likely to cause trouble. It is the shoe that has to stand the most of the wear and tear and to take the strain and is built to take care of this hard work and also protect the tube. The fact that a poor shoe contained a good tube would not prevent a puncture or blow-out.

INSTALLING NEW BUSHINGS.

(R. E. R., Globe, Mass.)

I have recently put in new bushings in the piston end of the connecting rods of my ——— car and after running a little while the motor seems to become so tight as to labor all the time. Can you suggest anything that might be the matter? The lubrication seems all right.

It is very likely that the trouble arises in some way from the bushings you have put in. In installing new bushings, such as in wrist pins, or upper end of the connecting rod, it is always important to see that the holes or openings in the bushings line up with the openings in the main piece. This is shown in the sketch. If care is not taken to do this the bearing, receiving little, if any, lubrication, will become overheated and bind, or possibly burn loose. If you are not sure



Illustrating Proper Method of Installing New Bushings in Piston End of Connecting Rod.

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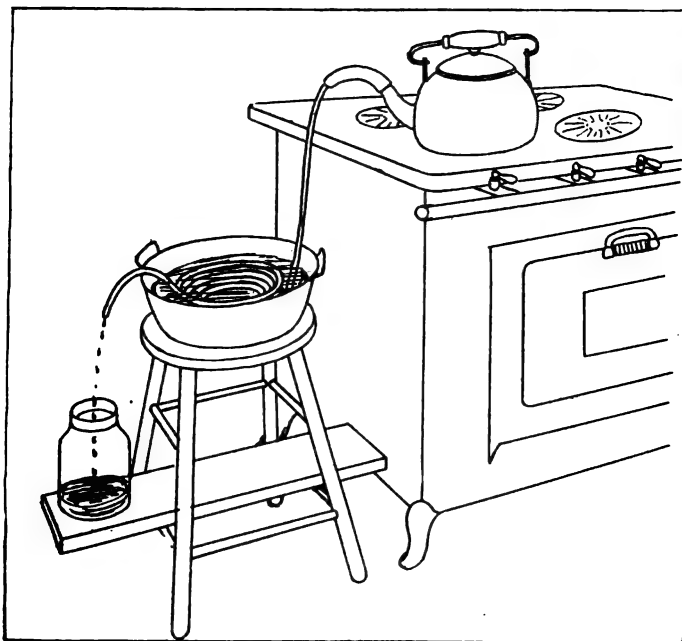
on this point it is advisable that you investigate, as no-doubt this is the cause of your trouble.

DISTILLING WATER FOR BATTERIES.

(R. W. R., Providence, R. I.)

Since all instructions pertaining to the care of storage batteries call for distilled water to replenish the supply in them, will you kindly state some simple way of obtaining distilled water without having to be dependent upon the corner drug-gist? Also will not rain water do as well?

Distilled water is water that has been turned into steam and cooled and collected again. You can easily put up some for yourself at home with very little trouble. Coil a length of annealed copper tubing so it will fit in a dish pan, having each end in the position shown in the illustration. To the snout of a tea kettle connect one end of the coil by a rubber hose or tube and have the other end of the coil bent so the distilled water will drip into a bottle. Fill the dish pan in which the coil is placed with water, which must be kept cool either by frequent changing or by allowing a fresh supply to run into it during the process. When the water in the tea kettle begins to steam it will pass through the snout into the tube and through the coil, where it will be cooled and con-



Home Made Device for Distilling Water for Use in Storage Batteries.

densed into water again. It falls into the bottle as distilled water, being as pure as desired for storage battery purposes. Regarding rain water, this is almost as good, providing it is collected when falling into a clean container that is afterwards properly corked to prevent the absorption of impurities. In fact, this is recommended by the storage battery makers as a substitute for distilled water when the latter is not available. Practically it is the same thing.

NOISY VALVE TAPPETS.

(J. W. T., West Mansfield, Mass.)

On my engine the push rods or valve tappets have become very noisy and as there is no provision for adjustment, I would like your advice as to the best way to remedy this. Between some of the tappets and valve stems there is an eighth of an inch clearance. Would it be practical to have either the valve stems or push rods swedged down and drawn out to greater length, later filing down the ends to secure proper clearance?

The practise of lengthening the stems or tappets, as you suggest, was once a common method of remedying this

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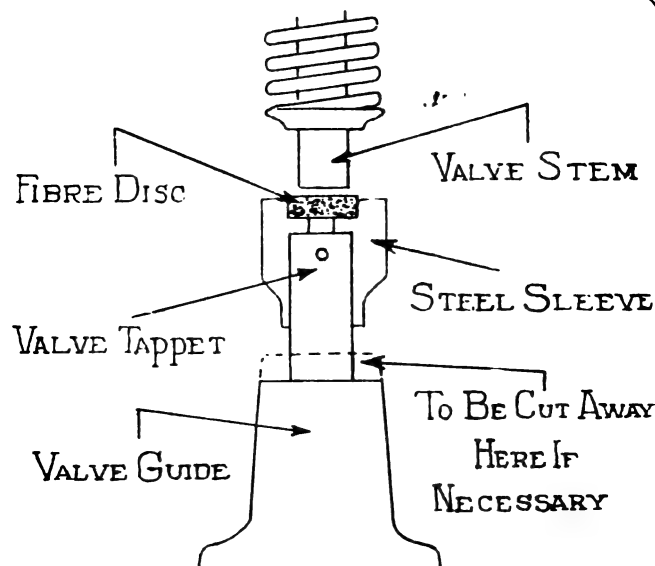
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trouble, but at best it is unsatisfactory. In fact, it is productive of other troubles as serious and annoying as the noise and lack of power due to insufficient valve opening. Most all cars made today have adjustable tappets, and by taking a little time it is possible to provide the same advantages for cars without this feature. This is often done in one of two ways. The first and best method can be used only where there is sufficient material to work on. Assuming that you have the material, the first thing to be done is to have the tappets removed and have the hardening or temper taken out of them. This you can do yourself by heating the pieces to a dull red heat and allowing them to cool while immersed in a bed of sawdust. While this is not a very exact method, it is approximately perfect for the work in hand.

Having annealed the tappets it is best to cut about $\frac{1}{8}$ inch from them, and also on each cut a fine thread, fitting a crowned nut and a shallow nut for a locking device. The crowned nut should be hardened and it is best to have it done by some one having experience and knowledge in this line. This scheme will be found to give you adjustable tappets that will wear a long time and may be adjusted to give as little noise as desired by exercising a little patience while doing it.

The other method is the one used before the adjustable tappet became so common. This consists of fitting a steel sleeve over the top of the push rod and in this sleeve make



Practical Method for Rectifying Noisy Valve Tappets.

a recess to be filled with a piece of hard fiber compound, the whole to be held to the rod with a pin. This plan is shown in the illustration. If the cross section of the push rod is large enough the sleeve may be eliminated and the fiber packing inserted in a hole drilled in the top of the push rod.

CONCERNING THE STORAGE BATTERY.

(Dr. H. J. P., Ragersville, O.)

I have a six-volt storage battery for ignition and starting purposes in a — 30 horsepower touring car. In an early issue of The Automobile Journal will you please state in detail how to take a Williard battery apart, clean and repair leaky cells and then reassemble the same?

As a battery is used, sediment collects in the bottom of the jars, due to the gradual wear on the plates. Great care should be exercised that this deposit does not touch the bottom of the plates, thereby short-circuiting them and doing much damage. The following operations are necessary for the disassembling of the cells and the cleaning out of the sediment:

In the case of burned pillar post connections a hole should be drilled with a one-half-inch machine drill where the pillar



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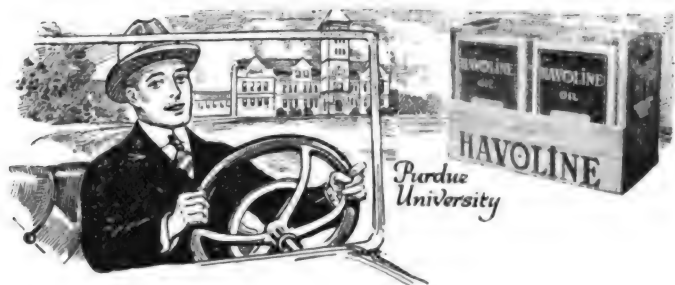
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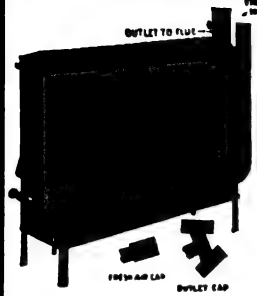
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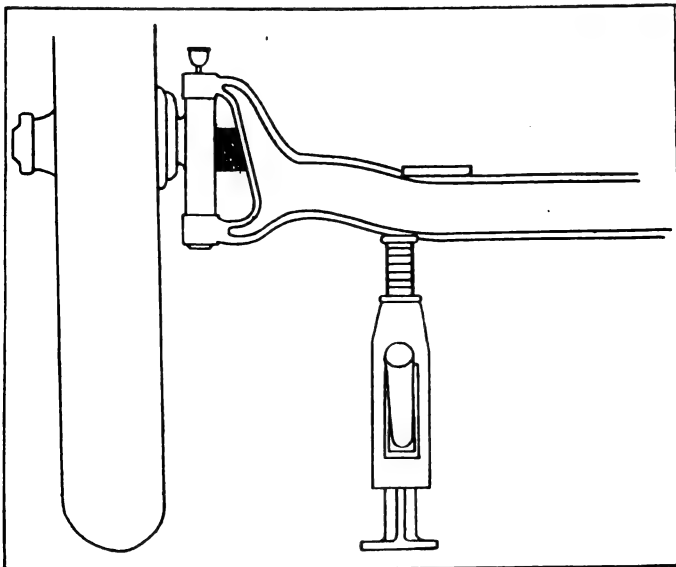
strap connector is burned to the pillar post and the strap connector can then be lifted off. To tear down batteries with L straps, the strap burning is sawed in two just above the line between the adjacent jars.

The sealing compound can now be detached from the jar with a hot putty knife and the cover removed. If the battery has bolted top connectors and soft rubber sealing gaskets, all drilling and cutting out of sealing is eliminated.

The bolts and rubber gaskets should be carefully removed and washed in clean water. The connecting straps, washers and rubber covers should be similarly cleaned. The next step is to pull one element out at a time and carefully remove the separators. Rinse the elements by dipping them in water and pour the electrolyte from the cell into a carboy, being careful not to draw off any of the sediment. The jars may now be thoroughly cleaned with water.

When reassembling the elements, use new wood separators and then place the assembly back in the jar. Some battery manufacturers advise that the old electrolyte can be made use of, but as some new will be required, it is the better plan to use all new electrolyte of 1.200 specific gravity. After the cells have been treated in this manner the covers can be put on and resealed and the connectors burned back or bolted. You should next take the battery to an expert workman and have it properly charged.

It is not clear what you mean by leaky cells. If the cells



Method of Inserting Hard Wood Wedge While Testing for Loose Wheel or Bearings.

are cracked, they cannot be repaired and must be replaced with new ones. If you are not thoroughly familiar with storage battery construction, it is better to have the work done by an expert.

LOOSE WHEELS.

(E. A. T., Johnstown, Penn.)

The front wheels of my car have developed a rattle which is noticeable when driving over hard, rough places, such as pavements. How can I tell whether this is due to the king bolt being worn or to the bearings needing adjustment?

You could easily tell this by making what adjustment you could on the bearings and then drive over a rough place that caused rattle before. If the trouble was in the bearings you will probably hear no rattle. However, a more positive way to do this and, possibly, more satisfactory, considering the satisfaction it would give to know for yourself just what is worn, would be to drive a hard wood wedge between the axle and the steering knuckle, which will hold them rigidly in a fixed relation to each other. Jack up the wheel and shake it sideways or up and down, grasping the tire or rim by each hand placed about opposite each other. Any looseness must

then be in the bearings, which you should take up until there is no shake and the wheel revolves freely. Now, by removing the wedge and shaking the wheel again you will know that any looseness will be in the king pin bearings. If it is very bad you probably will need to replace the king pin and bushings, as replacing either the pin or bushings alone is unsatisfactory in many types of construction.

PART WON'T WELD.

(J. G. M., Taunton, Mass.)

I had occasion lately to have several broken parts welded and some times they are returned welded and at other times built up with a brass colored substance. When questioned the man in charge said this was unavoidable, as some of the pieces I had sent in were cast iron and some were malleable iron. I have no doubt but others besides myself would like to be enlightened on this point, so will you kindly advise through your columns just what is the difference in these materials which look so much alike?

From your communication it would seem that you want to know what difference there is between malleable iron and cast iron that prevents the latter being welded. It is a fact that while cast iron can be welded, malleable iron cannot. The term malleable iron means nothing, except as a name. It should not be confused with wrought iron, which is malleable, i. e., workable by heat and blows.

Malleable iron, as usually understood, is a white cast iron, which by treatment and decarbonization becomes partially malleable. It is usually used in construction that does not require the strength of cast steel or forgings, but where the brittleness of cast iron is not practical for use. To a certain extent the use to which a piece has been put will tell whether it is cast iron or malleable iron, but a simple way to test it is to try it with a file. Cast iron is considerably softer.

This, however, is an uncertain method, as cast iron varies considerably. Accurate determination can sometimes be made by a color test. The fracture of cast iron gives a gray color, while that of malleable iron is white at the centre, shading to black at the surface and adjacent thereto. So while the cast iron has but the one gray color to all fractures, malleable iron has two or three distinguishing colors, but always the black near the surface.

Should it be that you are still in doubt the only absolutely positive test you can apply is the flame test. Under an oxy-acetylene flame cast iron melts readily, while malleable iron, when a section is heated to the melting point, it seems to draw away from the flame and drop, or crumble, slightly. Once having tried this on the different pieces under discussion, you will readily see the difference in the performance of the two.

It is partly owing to this fact that malleable iron cannot be welded, that is, in the sense that we weld cast iron and aluminum, etc. What is done is to prepare the piece in the same way as for cast iron and use a bronze rod, or filler. In doing this you must be careful not to melt any part of the piece, but when it reaches a bright red heat add the bronze rod. Also be careful that the cone of the flame does not come in direct contact with the bronze. Having finished the weld it may be ground smooth and painted with asphaltum, or other similar paint, and the fact that there are different materials there will never be noticed, nor does it matter as far as the strength of the joint is concerned.

REMOVING CARBON.

(M. de L., Woonsocket, R. I.)

Will you kindly publish in your columns a method for removing carbon that can be used without much trouble and that will be effective and not expensive?

There are a number of preparations on the market for removing carbon. Some are in the form of a liquid to be injected in the cylinder and others are in the form of pills or powder form. These are either introduced while the motor is running and warm or they are put in with the gasoline in the tank. Aside from these chemical preparations there are

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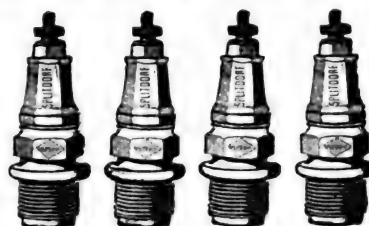
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physical or metal objects some times put in the cylinder which, knocking around, loosen up the carbon which is blown out with the exhaust. The value of any of these methods is best determined for one's self by experimentation. Of course the best way to get rid of carbon is to thoroughly clean it out, which is done by having it burned out by the oxy-acetylene process or by taking the motor down sufficiently to clean off all deposits.

As a means of best suiting your desires, follow this method, which is now quite common with those who use their cars a great deal. This is to start the motor up and open the muffler cut out. While this is not absolutely necessary, it is best to do so, as it prevents the muffler from becoming clogged up and also will show you how much carbon is ejected. When the motor is warmed up introduce kerosene between the carburetor and the intake. This is often done either by means of a small tapped hole in the intake to take a small pipe (screw in plug when not using) through which the kerosene is poured, or by introducing it through the air valve. Bear in mind that the engine must be carefully watched and kept running fast all the time, because if it should stop it would be hard to start up. Usually from a pint to a quart of kerosene is used and the motor kept running until the smoke of the exhaust ceases to be black. You will find after doing this that the ground under the cut out opening will be covered with a small pile of what looks like coal dust.

Some times a fine spray of water is introduced after the kerosene has been run through. This turns to steam in the cylinder and thoroughly scavenges the walls and top of the piston and by some is believed to be more effective than the kerosene. As some recommend the use of the water alone (in fact there are now devices to permanently attach to your motor for injecting water) one cannot go far wrong in using a combination of the two methods. One should be careful not to have too large a stream flowing; a small stream is better, although it takes longer. As the mixture in the carburetor is not affected in any way no adjustments or alterations are necessary after using this method. It is well to clean the spark plugs after cleaning out carbon and see that the points are correctly spaced.

WATER IN THE CRANK CASE.

An interesting explanation of the "phenomenon" of finding more or less water in the crankcase of the motor when draining off oil is offered by the Burd High Compression Ring Company. The presence of water when an inspection showed no breaks in the water jackets or connections has often been the cause of worry on the part of the car owner.

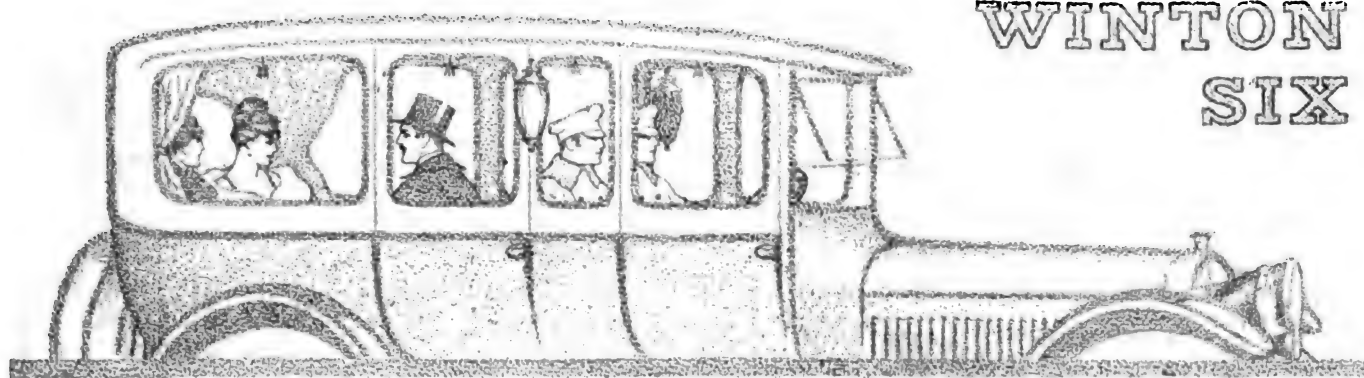
The explanation is that water is one of the constituents of gasoline and its presence is but normal in every motor. Gasoline is a mixture of a number of compounds of hydrogen and carbon which combine with the oxygen of the air admitted through the carburetor to form water and carbon dioxide. Hence water is always one of the products of combustion and at the temperature of explosion in the automobile motor exists in the cylinder in the form of super-heated steam at high pressure.

The Burd company calls attention to the statement that with the ordinary slip piston rings there is bound to be slight leakage of the products of combustion past the rings into the crank case. As the super-heated steam enters the case it expands rapidly and as it cools condenses into fine globules of water on the crank case walls and eventually finds its way to the lowest level. The carbon dioxide, however, is a fixed gas and simply passes out through the breather tubes. The water continues to collect as long as the motor is operated.

In view of the foregoing it may be easily understood that leaky and ill-fitting piston rings and scored cylinders will allow a larger quantity of gas to blow by and consequently more water will condense in such circumstances.

For removing tarnish from nickel a good rouge, such as is used for cleaning silverware, is about the best thing. Nickel trimmings may be prevented from tarnishing by frequently rubbing the surface with an oily rag. This will keep them bright and makes polishing unnecessary.

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OCT. 10, 1916.

NO. 5.

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Treasurer . . WILLIAM H. BLACK
Secretary D. O. BLACK, JR.

Published the 10th and 25th of each month by the

AUTOMOBILE JOURNAL PUB. CO.,
Times Building, Pawtucket, R. I.

IT NOW Appears that motorists can soon expect some uniformity of traffic laws as they apply to the operation of motor cars on the public highways, in both interstate and intrastate travel. This is apparent by reason of the fact that at a recent convention of the police chiefs of New York state one of the prominent discussions concerned a standardized code for the regulation of traffic. This action is a promising indication. For years motoring organizations and motorists as a class have been working toward standardized laws and have made considerable progress. The action of the police authorities gives additional weight to the movement.

ANOTHER Reason Why uniform laws can be expected soon is that two of the most powerful motoring organizations in the country, the American Automobile Association and the Safety First Federation of America, have recently taken up cudgels in a most effective manner. Their plans and activities are described in another part of this issue. Of course, complete success cannot be expected immediately; there is bound to be opposition, due to private and local interests. Every owner and operator of a motor car should get behind the movement.

NO ONE Can Deny that there is urgent need for reform in traffic laws, least of all a motor car owner. As matters stand today no man is exempt from the possibility of arrest while motoring from one state to another, unless he is supernaturally versed in all the varying degrees and shades of local ordinances. In fact, he is liable to be arrested while travelling from one city to another in the same state because of infringing upon a regulation that he could not possibly be expected to know was in existence.

THE Quickest Means of standardizing the laws of the road would be of course to have Congress assume the right to regulate the traffic. Unfortunately, this is constitutionally impossible, except as relates to interstate travel. Intrastate traffic must be governed by the state and local authorities. Consequently the move is to influence the several state legislatures and local law makers to make their rulings conform as nearly as practical to each other. It is along these lines that the greatest pressure should be brought to bear, and cities and towns should get together and bring order out of the present chaotic condition.

THE Feature Article in this issue is about a hunting trip in the pine forests of Maine, than which there is no better outdoor sport, especially when an automobile is used for transportation. As in other phases of life, the motor car has been the means of widening the scope of hunting, pushing back the boundaries as it were, by providing a means of getting to spots that were too far distant for travel on foot. With an automobile that is fully equipped for the trip, a hunting expedition to the Maine woods is ideal at this season of the year.

CARBURETION and Cooling troubles will soon be causes of worry, when cold weather arrives. Even now the early mornings are cool enough to make starting difficult. It is well to be prepared for the season, and any reader who is in need of advice can obtain it promptly and in large measure by addressing a letter to the Mechanical Editor at the Editorial Office. He will be glad to advise as to chemical mixtures and the like for the cooling system and as to mechanical means of getting the greatest measure of service from the car in cold weather.



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The — AUTOMOBILE — JOURNAL

OCTOBER 10, 1916.

VOL. XLII.

NO. 5.

Hunting Big Game in the Wilds of Maine by Motor Car

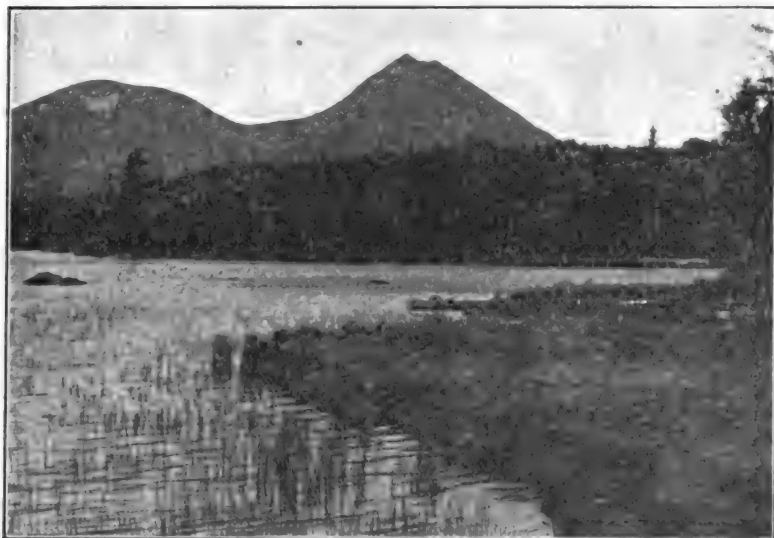
Description of a Possible Motor Trip in Search of the Wild Denizens of the Pine Tree State's Forests.

WHEN the hunter's moon makes its appearance thousands of nimrods yearn for the bracing air of the Maine woods, where annually they sojourn to hunt big game and fleet birds. The Pine Tree state for nearly half a century has held a place uppermost in the hearts of sportsmen, but it did not become the mecca for so many thousands of the followers of outdoor life until the advent of the automobile. The motor vehicle has eliminated many of the hardships of long, slow journeys through the vast expanses of forest and woodland and made accessible places that were formerly difficult to reach in the time available for a trip. The hunting trip is now made in de luxe fashion, comparatively speaking, and the hunter who formerly was restricted to hunting over areas nearby the railroad centres or stations, owing to a limited time allowance for his expedition, can now penetrate the innermost recesses of the big state without encountering any great difficulties or unpleasantness in getting to places where hunting or fishing is good.

Automobile Ideal for Hunting.

The automobile is especially adapted for a hunting or fishing expedition. It enables the members of the party to carry along practically everything needed to make the trip comfortable and pleasant. Formerly the hunter cut down his equipment and supplies to the very bare necessities to avoid the tedious and cumbersome task of toting a heavy load. The establishment of hundreds of hunting camps throughout Maine has also greatly increased the enthusiasm for hunting and fishing in that state, as many of these places are so located that a party can reach them by automobile and all the conveniences, in-





Where Hunter and Fisherman Find Delightful Pastime—Mt. Katahdin in the Distance.

cluding shelter, are prepared for their reception. Some parties, however, prefer to carry all their own equipment and make their own camps as they move about. For anyone making their initial hunting trip into Maine it is advisable to locate at one of these camps, as the amateur woodsman has considerable to learn if he is going to penetrate very far into the interior of the wilds.

Making camp by the automobile, however, at any spot that might suit the fancy of the party has its allurements. The appeal is particularly strong to the experienced hunter, as it savors of the real outdoor existence, whereas the comforts of a modern hunting camp lends too much of a domestic atmosphere to the outing.

At this season a description of conditions and routes to be encountered by the tourist on a hunting expedition in Maine are particularly appropriate and interesting, even to persons not at liberty to make the trip this year.

Popular Hunting Districts Easily Reached.

The principal highways leading into Maine run northward from Boston through Portsmouth, N. H., Biddeford, Me., Saco and Portland, where several highways branch off in different directions leading into the popular hunting districts. Several well known thoroughfares also lead into the hunting sections in the western part of Maine from New Hampshire. One leads across the border from Conway, N. H., and runs into Fryeburg, where branches run off to the north, south and east, through and around the group of lakes north of Sebago lake and including the latter. Further north a highway enters Maine from Gorham, N. H., and leads into Bethel, where it is intersected by a road running north and south along the western border of the state through a very wild section. Still further north, along the border, a route enters the state from Errol, N. H., and passes south of the Rangeley lakes.

The most popular hunting sections are located in the central western part of Maine, bordering on New Hampshire and the Province of Quebec and in the central northern section and around the group of lakes in the extreme eastern section. The latter are most easily reached by automobile over the main highways leading out of Portland along the Kennebec river through Augusta or along the seaboard through Bangor and along the Penobscott river. The territory in the western sections, where there are a large number of hunting

camps, is reached through Lewiston from Portland. This route followed through beautiful country into Winthrop and past the Belgrade lakes, leads up through the state onto the main highway to Quebec. A road branches off this route at either Norridgewock or North Anson onto the main road leading to Greenville on the extreme southern point of Moosehead lake, which is located in a territory that has become famous among hunters from all over America. Directly west of this section there are hundreds of beautiful lakes lying in a mountainous region with rivers running through the valleys, some flowing in a circuitous course into the tributaries of the St. John river and others to the southward into the Penobscott.

The principal highway travelled to reach different points in this section runs northward from Bangor through Old Town, Moron, Ashland to Fort Kent. Many of the hunting camps and spots are close by this thoroughfare, but the majority are located further in the interior of the state, among the lakes and mountains and cannot be reached by automobile. Some of the tote roads and other roads leading off the main highway can be traversed by automobile, but as a rule these do not afford very favorable passage. The custom with most motoring parties when going to an isolated camp has been to leave their cars at points where they pass from the settled sections into the woods. Equipped, however, with one of the modern camping outfits that are made specially for automobilists, a party could make its camping headquarters most anywhere in a spot that was accessible from the road and when it came time to break camp they would have immediate means of conveyance back home.

The weather at this time of year in Maine is pleasant, but the nights are quite cold and plenty of blankets, sweaters, gloves and other suitable clothing for keeping warm are essential. Heavy automobile robes will also be found useful.

The Maine laws governing the entry of non-resident owners in automobiles are very lenient. The owners are allowed 30 days in the state without registering their cars, providing the operator is licensed and car is registered in another state and number plates are displayed. If the party intends to remain longer than the 30 days prescribed they are required to pay the same fee as residents. If the length of the stay is known in advance of the trip into the hunting country, it is advisable for the party to apply for registration at the office of the secretary of state on the way north. The registration fee ranges from \$5 to \$15, according to horsepower, per year, but cars registered between Oct. 1 and Dec. 31 can be registered for half the regular fee.



What One Automobile Party Brought Back from the Caribou Hunting Section.



An Example of the Size of Fish to Be Found in Almost All of Maine's 1500 or More Lakes.

A brief geographical sketch of the state is also appropriate, as Maine has some distinguishing features possessed by none of the other states of the Union. From north to south its greatest length is 303 miles and it is 212 miles across at the widest part. Of the total area, 31,500 miles, 3000 square miles are water and 65 per cent. of the total area is covered with woods. It will be seen at a glance from these figures that it is an ideal home for game of all kinds. All the important fur bearing animals are found within its borders: Deer, moose, bear, fox, beaver, sable, weazel, martin, mink and squirrel. Rabbits, porcupines and wild cats are also plentiful. The 1500 odd lakes abound with many kinds of fresh water fish, including bass, pickerel, salmon trout, rainbow trout, red and white perch and other species. Some of the trout lakes are 2500 feet above sea level. One man caught a brook trout last year weighing 11½ pounds, which is the record for the state. Another angler caught 1000 black bass on a fly in one month. Practically all the well known game birds abound throughout the hunting sections, including partridge, quail, woodcock and many varieties of ducks.

Hunting Laws Should Be Studied.

The non-resident visiting Maine on a hunting trip must observe a number of regulations that have been imposed upon hunters to preserve the game and protect the state's interests. Non-resident hunters must be in charge of a registered guide during the months of May to November, both inclusive, when camping and kindling fires upon wild lands while engaged in hunting or fishing. These guides are not allowed to pilot a party of more than five members.

While the members of the party should procure a copy of the hunting laws and read them carefully, they will not get into any difficulties with a guide, as these men are well posted on the laws and regulations, which are quite complicated. The expense of a guide for a party is not excessive, their charge for their services ranging from \$2 to \$3 a day.

The open season on deer is as follows: Oct. 1 to Dec. 15, in Aroostack, Penobscott, Washington, Hancock, Piscataquis, Somerset, Oxford and Franklin counties. In these counties one person is allowed to shoot but two deer in one season. During the month of November deer may be shot in the counties of Androscoggin, York, Cumberland, Sagadahoc, Lincoln, Waldo, Kennebec and Knox, but only one deer to a person may be shot in these counties. Deer may not be sold or given away to be taken out of the state. In the towns of Deer Island and Stonington, and on Mt. Desert Island, Hancock county; on Isle au

Haut, Knox county; on Cross and Scotch Islands, Washington county, and in the town of Perkins, Sagadahoc county, there is a perpetual closed season on deer. All hunting is prohibited on Kineo Point, Moosehead lake, in certain parts in the town of Eden (Bar Harbor) and on Prout's Neck, Cumberland county. There is a heavy penalty for shooting either animals or birds on Sunday and all night hunting is prohibited.

There is no closed season on bears, bobcats, loup-cervier or Canada lynx. Rabbits may be shot from Oct. 1 to March 31, and gray squirrels during the month of October. Ducks, brant and geese may be shot from Sept. 1 to

Dec. 15 inclusive. Open season on black-breasted and golden plover, jacksnipe and greater and lesser yellow legs is from Aug. 15 to Nov. 30 inclusive; rails, coots and gallinules from Sept. 1 to Nov. 30 inclusive; perpetual closed season on Hungarian partridge, Capercaillie, black game, all species of pheasant (except ruffed grouse or partridge), curlew, woodcock and all shore birds (except black-breasted and golden plover, Wilson snipe or jacksnipe, woodcock and greater and lesser yellow legs) and on all other birds (except crows, hawks, owls, English sparrows, mudhens, kingfishers, loons and blue herons, which may be killed at any time).

Partridge and woodcock may be shot in Oxford, Franklin, Somerset, Penobscott, Piscataquis, Aroostack, Washington and Hancock counties from Sept. 15 to Nov. 14 inclusive. The season is open from Oct. 1 to Nov. 30 inclusive in Androscoggin, Cumberland, York, Waldo, Knox, Lincoln and Kennebec counties. Game birds cannot be sold or purchased at any time and no person can kill in one day or transport in any one day more than five partridges, 10 woodcock, 10 ducks, 10 snipe and five plover.

Motor Boats Are Banned for Waterfowl.

Hunters are not allowed to use motor boats in the pursuit of waterfowl or any kind of sea birds in inland waters or on the bays along the coast or in the rivers. The use of dogs in pursuing deer is also prohibited.

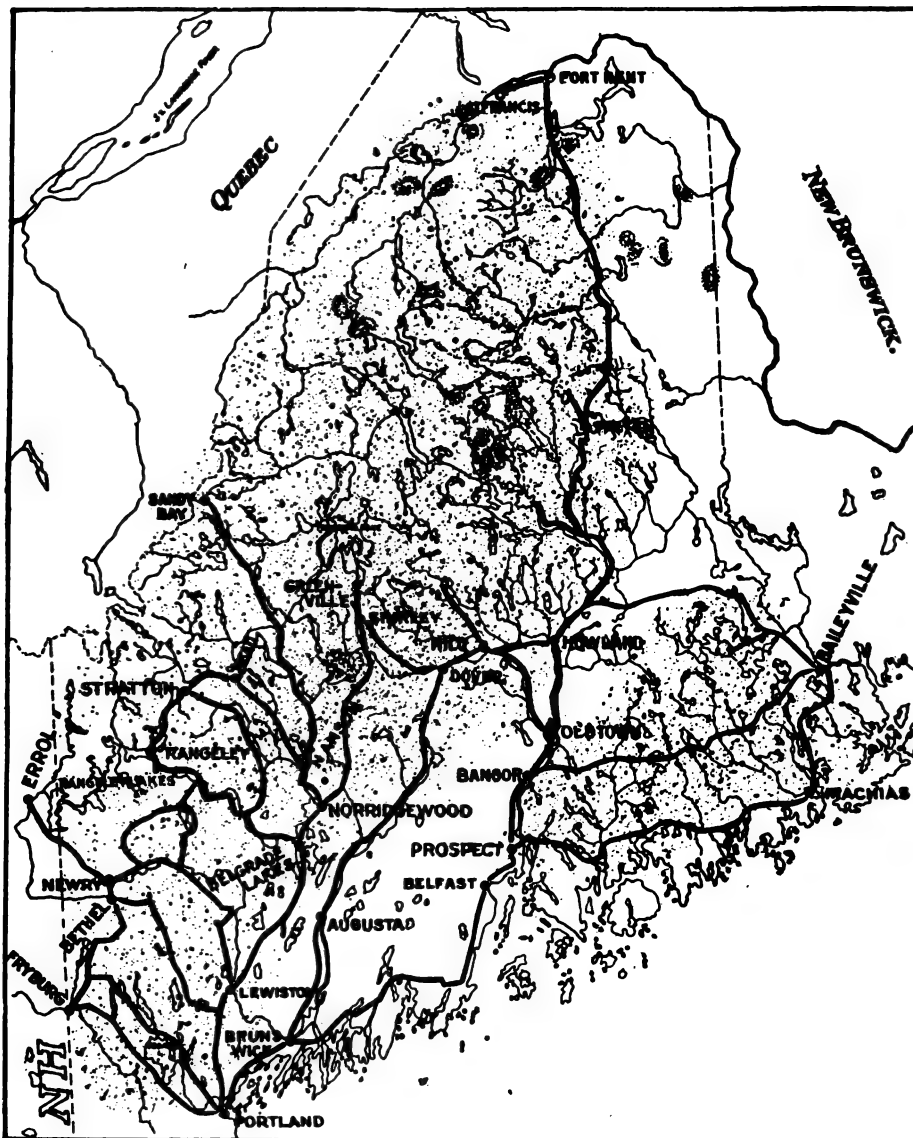
A fee of \$5 is charged for a license for a non-resident to hunt in any county up to the time the deer season opens in that county. To hunt during the deer season a license fee of



A Record Breaking Moose, Shot by Mr. W. L. Hodgkins in the Moose Country of Maine.

There are two coupons attached to the non-resident hunter's license, which entitle him to ship within or without of the state the carcass of a deer or part thereof which he has lawfully killed. The holder of the license must ship the game personally and present his license to the agent of the transportation company be-

The largest amount of products shipped from one of the Virginian counties in one year before the roads were improved was 49,000 tons. In 1909 the amount of dairy products shipped from that county was 115,000 pounds, and during that year 40 miles of road were improved at an expense of \$100,000. Two years later, in 1911, after the improvement, 71,000 tons of farm products and 237,000 pounds of



fore the shipment can be accepted. Non-residents may ship 10 ducks, 10 woodcock and 5 partridges from the state providing he killed them legally and they are tagged with the proper coupons from his license.

George P. Coleman, state highway commissioner of Virginia, has collected some interesting figures showing an ac-

dairy products were shipped, showing an increase of 45 and 140 per cent. in these two classes. Mr. Coleman's figures showed that the cost to haul a ton a mile on the unimproved roads was 20 cents. It was 12 cents a ton a mile on improved roads. The average haul of 65,000 tons of products was eight miles. The improvement in the roads therefore effected a saving of \$41,600 to the farmers in marketing 65,000 tons of products, which is over two-fifths of the cost of the road work which effected it.

Some of these letters are so far-fetched that they seem beyond the pale of reason, but they nevertheless have found lodgment in the minds of credulous people. One was to the effect that Mr. Ford was going to sell cars at \$100 each on his birthday and also as a means of celebrating his son's wedding day. Another one stated that the Ford would be sold at \$100 provided that 1,000,000 persons sent in their names accompanied by \$1. Other similarly preposterous rumors have been circulated and found believers, who to ascertain their truth, have written to the Ford factory.

Vann H. Manning, director of the Bureau of Mines of the U. S. government, has warned gasoline users that specific gravity is not a satisfactory basis for the purchase of fuel, as tests with machines made during the past two years show less than two per cent. difference in power obtained between 74 gravity and 60 gravity gasoline. He also stated that it was estimated that at the present rate of consumption the gasoline supply in this country would not last much over 30 years.

A report made to Mayor Mitchell of the City of New York by the Department of Plants and Structures, shows the results of the operations of the municipal garage maintained as a livery system. This report says that operation costs were cut in half, the cost for the first six months being \$51,200 as compared with \$100,655 during the corresponding period in 1915.

These results have led the finance commission of the City of Boston to recommend to Mayor Curley that a similar system be put in force.

Homans' "Automobile Handbook," written by J. E. Homans and just published by Sully & Kleinteich, 373 Fourth avenue, New York City, is a very complete summary of the principles of automobile construction and is well illustrated throughout with both cuts and diagrams. It is bound in cloth and sells for \$1 net.

Owing to the passage of an act in 1915 by the Connecticut Legislature forbidding the towns, cities and counties of the state from regulating the speed or equipment of automobiles, the headlight evil continues in Connecticut without any immediate outlook for any relief.

World's Records Fall at Sheepshead Bay.



The Start of the Astor Cup Race, with 31 Cars in Line.

Aitken Takes the 250 Mile Race for the Astor Cup at a Speed of Better Than 104 Miles an Hour—Resta Falls by the Wayside.

AITKEN'S victory in the Astor Cup race at the Sheepshead Bay Speedway on Long Island on Saturday, Sept. 30, when he won the 250 miles classic, brought with it not only \$10,000 in cash and placed him at the head of the list of American automobile drivers, but puts him in line for the \$13,000 cash and trophies which go with the title of "Champion."

It was a noteworthy victory also, as it was won over the largest field of fast drivers that ever started in such a contest. There were 31 starters and Aitken outraced and outwitted them all by driving his car at a consistent speed throughout the 250-mile grind at an average speed of 104.83 miles an hour, his elapsed time for the distance being 2:23:04.03. Incidentally, he smashed the world's record for the distance by nearly three minutes, the best previous time being two hours, 24 minutes and 19.55 seconds.

The two cars that trailed him in, however, also lowered the old record, Rickenschacher, in a Maxwell, finishing second in 2:24:19.54 and Ira Vail, in a Hudson Super Six, crossing the tape third at 2:34:01. Pullen in a Mercer, Klein in a Crawford, Devigne in a Delage, Mulford in a Duesenberg, Hughes in a Hoskins Special and Milton in another Duesenberg came in in the order named and were all within the money. The other

FINISH OF ASTOR CUP RACE.

Driver	Car	Time	M.P.H.
Aitken.....	Peugeot	2:23:04	104.83
Ricken'er.....	Maxwell	2:24:19	103.90
Vail.....	Hudson	2:34:01	97.4
Le Cain.....	Delage	2:34:42	97.0
Pullen.....	Mercer	2:37:26	95.2
Klein.....	Crawford	2:38:01	94.8
Devigne.....	Delage	2:38:31	94.6
Mulford.....	Dues'berg	2:42:02	92.3
Hughes.....	Hoskins	2:42:56	92.1
Milton.....	Dues'berg	2:45:36	90.6
Meyer.....	Pugh	2:47:11	89.9
Adams.....	Adams	2:55:06	85.8
D'Alene.....	Crawford	3:04:01	81.7
Burt.....	Ogren	3:06:20	80.5

four entrants who finished were Meyer in a Pugh Special, Adams in an Adams Special, D'Alene in a Crawford and Burt in an Ogren.

There was about 50,000 in attendance and a large proportion arrived at the grounds in automobiles, over 5000 being parked at different places about the big speedway grounds and outside. Weather conditions were excellent for the event and the track was in fine condition, as was demonstrated both by the fast speed made and the few accidents and trips to the pits. Thirty-one cars started; 24 were still in running at 100 miles and 14 crossed the finish line.

The 17 entrants that did not finish fell by the wayside through various faults of their cars which failed at different stages of the race. W. C. Muller in a Dans

L'Argent, with which he had some trouble in getting away at the start, was the first one out, the same trouble that caused his machine to hesitate at first, developing into a fatal ailment.

The race was devoid of any serious accidents, a fact which was probably due to the unusual lack of tire trouble. At one time, however, when Grover Ruckstall made his exit from the running with his Mercer, it appeared at first as though at least he and his mechanic would be put on the fatally wounded list. While turning the north turn on his 130th mile the car blew out a rear shoe and pirouetted down the embankment, turning over at the bottom. Both Ruckstall and his mechanic, Clarence Quicksell, were underneath when the car turned turtle, but had climbed out unhurt by the time the crowd arrived. They apparently had suffered neither bruise or scratch, but were certainly out of the running, as the car had not fared so well.

Three drivers, Dario Resta with a Peugeot, Joseph Christiaens and Louis Chevrolet, both in Sunbeams, were among the favorites who went out before the race was half finished. Resta, who has held the lead among the race drivers for championship honors since early spring, was looked upon as the most probable winner up to the 100th mile, when his car caught fire while he was holding sec-



Rounding the Banked Curve Below the Grandstand, with the Leaders Driving at More Than 100 Miles Per Hour.

ond place. The fire was extinguished, but it had incapacitated the car and Resta's hopes vanished. This accident cost him the lead in number of points, which he sacrificed to Aitken.

The two Sunbeams, which outclassed all competitors in the elimination trials preceding the race, Christiaens making a new world's record of 115 miles an hour, were in the lead until they gave up. Chevrolet was through at 26 miles, while his partner Christiaens lasted until the 100th mile, when he too dropped out.

Chevrolet was travelling at a terrific pace when a burnt bearing sent him to the pits and out. He had taken the lead from Aitken in the fourth mile and held it up to the 25th mile. At 10 miles he had established a new world's record for that distance, having covered it in five minutes, 43.7 seconds, which compares with

5:45.92, the record made on the same track last year. At 20 miles he had hung up another record of 11:9.5 for the distance against 11:24.67, the old record.

At the 30 mile post Resta took the lead and held it for 20 miles, when Aitken spurred into first place and held it until the finish, never once going to the pits for tires, oil or gas.

From the 10th, when Chevrolet made his record, up to the 100th mile the pace had slackened, but from that point on the leaders set a record breaking pace, Aitken crossing the tape at the 150-mile mark in 1:25:58.65, as compared to 1:27:10.93, the old record for the distance.

Pullen's performance was quite remarkable as compared to the others that finished near the top. He made five different stops at the pits, losing a total of

six minutes and 42 seconds. During those stops five tire changes were made, spark plugs were changed once, oil was taken on twice and gas once. "Five" seemed to be his mystic number, as he also finished fifth.

Vail lost but 20 seconds when he stopped once at the pits to change a right rear tire. Le Cain, who followed the Hudson in his Delage at the finish, also made but one stop, using up 55 seconds in an inspection of his motor. Klein, who finished sixth in his Crawford, visited the pits once, changing a right front tire and replenishing the gas tank.

Mulford suffered heavily at the pits, losing nine minutes on one stop to repair a broken air line and two minutes on another stop to adjust the carburetor on his Duesenberg.

Hughes lost three minutes in the pits

TABLE OF SPECIFICATIONS AND EQUIPMENT OF CARS THAT STARTED.

Driver	Car	Bore	Stroke	Disp.	No. Valves	Valve Location	Pistons	Plugs	No. of Plugs	Carb.	Wheel base	Wheels	Oil
Aitken	Peugeot	3.65	6.65	274	16	Head	Levett	K L G	4	Zenith	105	R-W	Oilzum
Rickenbacher	Maxwell	3.75	6.75	298.2	16	Head	Levett	K L G	4	Miller	106	Houk	Oilzum
Vail	Hudson*	3.50	5.00	288.6	12	Side	Levett	Rajah	8	Hudson	104	R-W	Veedol
Le Cain	Delage	3.63	6.75	286.0	16	Head	Levett	K L G	4	Miller	106	R-W	Oilzum
Pullen	Mercer	3.87	6.37	300.7	16	Head	Aluminum	Rajah	8	Zenith	108	R-W	Oilzum
Klein	Crawford	3.75	6.75	298.2	16	Hor. in head	Levett	Rajah	8	Miller	106	R-W	Oilzum
Devigne	Delage	3.63	6.75	286.0	16	Head	Alloynum	K L G	4	Miller	106	R-W	Oilzum
Mulford	Duesenberg	3.75	6.75	298.2	16	Head	Levett	Rajah	8	Miller	106	R-W	Oilzum
Hughes	Hoskins	3.75	6.75	298.2	16	Hor. in head	Aluminum	Rajah	8	Miller	105	R-W	Mobilolil
Milton	Duesenberg	3.75	6.75	298.2	16	Head	Levett	Rajah	8	Miller	106	R-W	Oilzum
Meyer	Pugh	3.75	6.75	298.2	8	Hor. in head	Aluminum	Rajah	8	Master	108	Houk	Oilzum
Adams	Adams Sp.	3.75	6.75	298.2	16	Hor. in head	Aluminum	A. C.	8	Master	100	R-W	Oilzum
D'Alene	Crawford	3.75	6.75	298.2	16	Hor. in head	Levett	Rajah	8	Miller	106	R-W	Oilzum
Burt	Ogren	3.75	6.75	298.2	8	Hor. in head	Levett	Rajah	8	Miller	105	Houk	Castor
Muller	Dans L'Argent*	3.5	5.00	288.6	12	Side	Cast Iron	Rajah	6	Hudson	103	R-W	Oilzum
Henderson	Maxwell	3.75	6.75	298.2	16	Head	Levett	K L G	4	Miller	106	Houk	Oilzum
Chevrolet	Sunbeam*	3.28	6.14	294.2	24	Head	Levett	K L G	6	Claudel	113	R-W	Castor
Christiaens	Sunbeam*	3.28	6.14	294.2	24	Head	Levett	K L G	6	Miller	113	R-W	Castor
Devlin	Duesenberg	3.75	6.75	298.2	16	Hor. in head	Levett	Rajah	8	Miller	106	R-W	Mobilolil
Buzane	Duesenberg	3.75	6.75	298.2	8	Hor. in head	Levett	Rajah	8	Miller	104	R-W	Oilzum
Gable	Erbes	3.63	7.19	298.3	16	Head	Alloynum	K L G	4	Miller	98	R-W	Castor
Moore	Crawford	3.75	6.75	298.2	16	Hor. in head	Levett	Rajah	8	Miller	106	R-W	Oilzum
Ruckstall	Mercer	3.87	6.37	300.7	16	Head	Aluminum	Rajah	8	Zenith	108	R-W	Oilzum
Resta	Peugeot	3.66	6.65	275.0	16	Head	Levett	K L G	4	Miller	100	R-W	Oilzum
Henning	Ogren	3.63	7.00	292.0	16	Head	Alloynum	Rajah	8	Miller	106	Houk	Castor
Lewis	Premier	3.65	6.63	274.5	16	Head	Levett	K L G	4	Miller	105	R-W	Oilzum
Galvin	Premier	3.65	6.63	274.5	16	Head	Aluminum	K L G	4	Miller	105	R-W	Oilzum
McBride	Olsen	4.34	5.00	295.0	16	Hor. in head	Aluminum	Rajah	8	H & N	108	R-W	Oilzum
Watson	Olsen	3.75	6.75	298.2	16	Head	Aluminum	Rajah	8	Miller	108	R-W	Oilzum
Wilcox	Peugeot	3.65	6.65	274.0	16	Head	Levett	K L G	4	Zenith	105	R-W	Oilzum
Rawlings	W. Duluth	3.75	6.75	298.2	16	Head	Levett	A. C.	8	Miller	106	R-W	Mobilolil

*The cars driven by Muller, Chevrolet, Christiaens and Vail were six-cylinder machines. All the others were four-cylinder. Bosch ignition was used on all cars except Vail's Hudson and Muller's Dans L'Argent, which were Delco equipped. Aitken, Lewis, Galvin, Watson and Wilcox rode on Goodyear tires and all the other machines were equipped with Goodrich Silvertown cords. Every car that started was equipped with Hartford shock absorbers and Boyce motor meters.

looking for a trouble that he and his mechanic were unable to locate. The other drivers that were in the money did not visit the pits.

Forty-five stops in all were made by the different cars. There was very little tire trouble, only seven tire changes being recorded, and of that number Pullen's Mercer accounted for five. Spark plugs seemed to be the cause of the most lost time, over 12 stops being made to change and clean them. Connecting rods were also a source of much trouble and a serious one, as eight different cars went out on account of either broken or burnt out rods, including Henderson's Maxwell, McBride's Olsen, Moore's Crawford, Lewis' Premier, Wilcox's Peugeot, Muller's Dans L'Argent, Galvin's Premier and Buzane's Duesenberg. The latter went out with a broken wrist pin. Minor troubles were responsible for the other visits to the pits.

Ralph De Palma suffered the keen disappointment of not being able to start after he had entered and qualified in the elimination trials. During a practise spin, which he was taking in the morning of the day of the race, to tune up his Peugeot, a valve broke and despite the efforts of himself and his mechanics they were unable to remedy the trouble up to the time the race started at 2:30 o'clock.

While Aitken, with a total of 2520 points for the title of "Champion Motor Car Driver of America" and for the Bosch trophy, is in the lead, he is but 120 points ahead of Dario Resta, who had a big start before Aitken won the Indianapolis Harvest Classic. Resta now has 2400 points and with these two stars so close to each other the next event, which will probably decide the championship, will be looked forward to with great interest. It will be a gruelling grind, as both drivers pilot Puegeots, which have won about all the honors on the American speedways this year. Rickenbacher stands third in the list as a result of securing second place in the Astor Cup and now has 1990 points, while De Palma is fourth with 1790 points.

The time and place for the next race, which will figure in championship results, has not been decided as yet by the A. A. A., but it is thought that it will be held in either New York or Chicago. There will be a large sum of money at stake for the winner of this event and the men who are now in the lead for the championship title will spare no pains or expense to prepare themselves and their machines for the battle of their lives.

Vincent Astor is the donor of the Astor Cup for which the big race is held annually at Sheepshead Bay Speedway, and is loaned each year to the winner of the event until the fifth year, when the driver with the largest number of points becomes the permanent possessor. This year's event was the second race for the cup and a certain number of points are awarded each one of the drivers finishing up to the 10th, the winner receiving 20 points and the others a number on a scale downward to three points, which is awarded the 10th man across the line.

ALCOHOL AS MOTOR CAR FUEL.

Prominent Boston Chemist Discusses Use of Alcohol in Motor Vehicle Engines.

THE thought uppermost with every motorist and manufacturer in the country during the past year has been largely concerned with the price of gasoline, and while there has been a slight drop in price during the summer, there is no assurance forthcoming from the gasoline producers that these new prices will continue.

With this situation in mind the announcements made regarding the possibilities of alcohol as a gasoline substitute at the chemical convention in New York City were of exceptional importance, especially so as they came from men high up in the world of chemical commerce. The statement by Arthur D. Little of Boston, an expert on wood waste, who is chemical counsel for the Canadian Pacific Railroad, was probably the most significant.

At a meeting of the Chemical club during the convention he said: "There is no longer any question of the commercial success in the manufacture of alcohol for automobiles. Experiments have shown that alcohol can be manufactured as low as 25 cents a gallon and at that price it will undoubtedly be preferable to gasoline.

"Alcohol is cleaner than gasoline, will not explode or catch fire and will develop practically as much horsepower. The decrease in the cost has come through improved methods in manufacture from wood waste, waste sulphite liquor and from molasses."

Previous to making this statement, Dr. Little pointed out that the horsepower of automobiles now totaled 60,000,000, and that it was increasing at the rate of 100,000 horsepower per day owing to the high rate of manufacture. He also discussed various processes of making alcohol and stated that the development of production on a larger scale will be necessary to the extension of its use as a fuel for automobiles.

In support of Dr. Little's contentions regarding the manufacture of alcohol, a message was read from Arthur H. Comey, superintendent of the Eastern laboratory of the Du Pont Powder Company, in which he said: "The manufacture of alcohol from sawdust is a commercial success and will grow accordingly."

In relation to the cheap production of alcohol, Dr. Kyries predicted that it would make possible the production of synthetic rubber at 25 cents a pound, which is approximately the cost of rubber turned out at the plantations.

AUTO CLUB OF VERMONT.

The Automobile Club of Vermont is one of the most progressive organizations of that kind in the country and is actively engaged in improving road and

other conditions for the benefit of the motorist throughout that state.

The club recently sent out a circular to its members requesting that they send in all the information possible regarding road conditions, whether railings at curves or culverts are in need of repair and as to their knowledge of men who drive automobiles under the influence of liquor or in a dangerous and negligent manner. A series of questions is asked, covering a wide scope, and the information obtained will be used to follow up any suggestions and obtain a speedy remedy for unfavorable conditions wherever possible.

"PATHFINDER THE GREAT."

The Pathfinder Company of Indianapolis, Ind., manufacturers of Pathfinder cars, have issued a very attractive pamphlet on the 12-cylinder car, entitled "Pathfinder the Great." An introduction is devoted to a description of the operation of the car and reasons why the company adopted the 12-cylinder motor with the valves in the head. Illustrations of the motor are shown and also the model 1-B seven-passenger touring car and the model 1-C three-passenger cloverleaf roadster.

OVERLANDS FOR PRIZES.

O. E. Goebel, president of the Consolidated Film Company, has given an order for 13 Overland cars which he will donate as prizes for the best idea submitted for a five-reel sequel to the company's "Mystery" picture. The country has been divided into 13 zones and one car will be given in each zone for the best idea submitted.

CONCRETE ROAD SURVEY.

A comprehensive survey of all the concrete roads in the United States will be made by the Portland Cement Association. The object of this work will be to determine their condition and to confer with local road authorities everywhere as to maintenance. In this way a real history of the concrete roads at present in the United States will be obtained.

HARKNESS RACE.

The Harkness trophy race of 100 miles will be held at the Sheepshead Bay Speedway on Oct. 28. A purse of \$10,000 in prize money has been offered and all the well known drivers of the country are expected to participate, as it is one of the last big events of the year.

Art and the Motor Car---The Artist's Opportunity.



The Graceful Lines of the Scripps-Booth Eight.

ART is the science of eye-appeal; the appearance-basis of attractiveness. If one build into a commercial product an appeal to the eye, he establishes the first point of salesmanship, which is impression.

The designing of a motor car is no longer a task for the engineer alone.

There was a day when it was merely a mechanism for traveling from place to place, a machine on which seats were mounted that one might enjoy the sensation of swift travel and novelty of mechanical progress. Today the sensation is old and the novelty become the usual.

With the world's acceptance of the motor vehicle and the perfection of car machinery, a new thing was needed to carry appeal further than mere mechanical construction. Comfort and performance stunts have been made a basis of sales. Freak demonstrations and misleading economy tests were tried and succeeded in attracting. Only recently has the value of eye-appeal been recognized, and art even considered in relation to motor vehicles.

The motor car today is a part of the home equipment; standing at the door it reflects the personality and the taste of the home within. Style has come to the motor car.

Reliability is the easiest thing to design into the present day automobile. Any modern motor car will travel from New York to San Francisco with a satisfactory degree of reliability, and some of the cheap cars with greater mileage per day than the heavy weight, more expensive constructions. The difference then between one car and another, after a certain ultra cheap class is passed, is in passenger comfort and the self respect of ownership. This self respect or pride value depends upon the authority of the design, and the degree of art involved in its make up. The art of car building is thus resolving itself more and more into a studio task.

If a car is designed for a certain excellence or standard of mechanical performance, its body lines must be so disposed as to proclaim and suggest that performance. If a car is designed primarily for comfort, the art lines should suggest comfort.

There are certain definite rules and principles of art which have been applied rarely in car design. They were not made use of until a few years ago. Even yet few companies employ artists on their engineering staff. The day will come when bodies will be designed by artists of national reputation spending all their study to make the bodies express by their lines, contours and arrangement, the individuality and performance the car possesses. If the body backs up in its appeal the statements of the advertising, and the performance and life of the car back up the appearance, the car will be a success, and the marketing of it accomplished along lines of least resistance and cost. Many a firm today, spending

thousands of dollars a year in advertising a body design on a good chassis, might save much by spending a small amount on the hire of an artist experienced in body work. There is real commercial value in an unique design of car. This has been lost sight of by many manufacturers. It is

the advertising value of every car running.

All cars look alike to most people, merely because the makers have followed each other and made the cars look alike. When one car or another goes by, the public does not distinguish it from the rest. One might hang a sign from end to end to proclaim the make, but the owner would not allow it. If the design be original so that even the man in the street names it as it passes, the car itself is a sign as long as its wheelbase and as insistent as its appearance.

Rules of Appeal in Body Design.

The rules of appeal in body design are not intricate, but very easily understood. All of the principles are, of course, not treated in this paper, nor can their application to individual requirements be detailed for different cars. The main ideas can, however, be outlined. One generally speaks of the "lines" of a car. It is true a car has lines, but they are not the greatest attraction basis of design. We speak of the human figure or face as having lines, but the profile of the face, for example, is not the most appealing view. Too often the profile of a straight side view of a car is laid out on the board quarter or half size and the art "lines" judged from this view. This is a view never had by the passer-by and if it were possible to have it there would be no life or action in it, and hence no appeal. All appeal to the beauty sense is by suggestion or implication. Mere lines cannot suggest to nearly as great an extent as masses and edges of shadows can. With the shadows should be included the reflections, which furnish new suggestive edges leading on the subconscious reasoning which gives us our final appeal decision. This is why a newly finished, highly polished body presents such an extreme appeal, compared with the same car finished dull, unless the car has been designed primarily for dull finish by having contours which make up for the lack of reflection suggestion.

Types of bodies built a few years ago have lost their appeal because they were not based on correct principles of art. In nature one thing grows from another, like the branches from the tree trunk, and the twigs from the branches. The newer streamline bodies aim at this principle in having lines continuous from front to rear with no break, one growing out of the other, but these are pleasing only to the extent that other principles as well are followed. Fig. 1 shows a hood and cowl with a definite break between these parts—a reverse

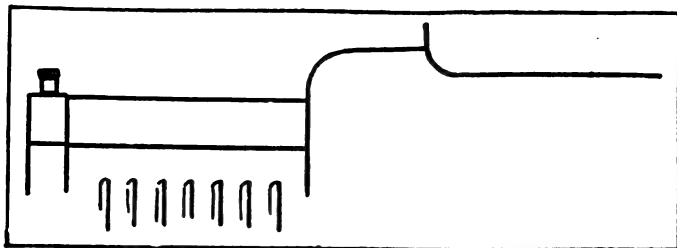


Fig. 1—Upper, Hood and Cowl with Break Between Them.

curve which, to look right, would necessitate a hood of different color from that of the cowl and body, to give a reason for the break.

The sketch in Fig. 2 shows the cowl and body lines growing out of the hood lines, as introduced first in this country by the Hudson, I believe, this being one art reason for the great appeal of its body design. The limousine top in this make of car did not look like an attachment or a box set on a touring car, but, by being continuous in line with the lower design, as part and parcel of and integral with the lower section. This idea of line continuity is one of the greatest problems in the streamline, curved top bodies.

Suggestive Lines.

We have learned, however, that shadows and reflections are more important than mere lines, and that one must grow from another or from a focusing curve. It is admitted generally that horizontal lines suggest speed and vertical lines stability. This is not true unless the eye hit the right part of the design first. To suggest speed the eye must first alight on the front end of the car and then travel back. Horizontal lines, once the eye is sent to the front end, will help to carry it back, and for this purpose are necessary, but they are useless unless the eye starts at the right place. This illustrates the reason for the nicked radiator or unusual fender arrangements in front on several cars. The Oakland has used the prominent radiator feature for some years, while the Paige in the new models gains front end attention by an unusual front shape and fender splash. Packard and Hudson gain attention by unusual radiator caps; the result is the same.

Vertical lines on a car indicate stability only if the eye travels upward from the bottom. One of the reasons for the charm of the pointed door or body hook just back of the hood, as used on coupe and limousine models of prominent makes, is that this accent, shown in Fig. 3, allows it to travel up and back. A curve to the roof, leading up and back also adds to the speed feeling and appeal of the design. A car with a flat roof and a big ventilator or railing on top looks unstable, rather than sturdy, even though the vertical lines are made more insistent.

Impressions from Proportions.

The sense of power in a car can be suggested in two ways; first by the proportion of hood length to the rest of the car, and second by hood height compared to body sill height.

Body width gives the impression and fact of roominess, while height from the ground suggests stability. Length gives the idea of ability to hold the road at speed, provided the mass of the body's design is carried up front.

Many cars fail in appeal by being too high in proportion to their width. This is sometimes due to frame necessities when a straight frame is used, and sometimes to mechanism carried too high. Cubical dimensions of the body give one a sense of weight or lightness in relation to the car, and by suggestion of operating expense appeal or repel. To look roomy a car must appear wide in proportion to its depth.

The mass of the running gear, the heavy look of the wheels, etc., suggest comfort. Big wire wheels of red or white denote luxurious riding, though they may ride no more easily.

A great deal of the pleasure of riding is marred by uncomfortable seats. Luxury in cushioning is to be sought, and high curved backs deeply tufted add to comfort, as well as appeal to the eye.

Colors.

The final appeal of exterior design is obtained by color and finish and this will depend largely on the experience of the buyer. Black brings out lines and reflections and hides shadows. White emphasizes mass and kills color. Strong colors do not appear well in combination with white, except in small spots or accents, or in striping. Black is a good color for a car of beautiful outline. White is preferable for a car of mediocre outline and gives a sense of largeness. This applies also to tones and colors between white and black. There is a color which best fits a given car. Manufacturing reasons, however, hinder the search for this ideal.

Eventually color will be chosen by the buyer for utilitarian reasons. A color that shows dust and dirt least will be preferred. This points to lighter colors, as black is hardest of all to keep clean, though the easiest to put on in manufacture.

A small vehicle needs more careful finish and appointment than a large one to obtain its measure of road respect. A big limousine obtains its road authority through its mass. A small car must obtain this through insistent appearance. Better finish and trimming almost to the point of flashiness are needed in a light car. What would be bad taste or poor art on a big vehicle becomes good taste on a light car for this reason. Enameled leather upholstery and a quilted dash might look out of place on a big car, but they are quite the thing on small construction.

The car of the future will be designed with art lines to

suggest the action of its mechanism. It will take every advantage of art knowledge to build up an appeal consistent with its mechanical performance. Speed, power, comfort, luxury, safety and economy will be suggested by appearance, by following art rules as faithfully as engineering rules are followed in the shop.

The automobile for tomorrow is the artist's opportunity.

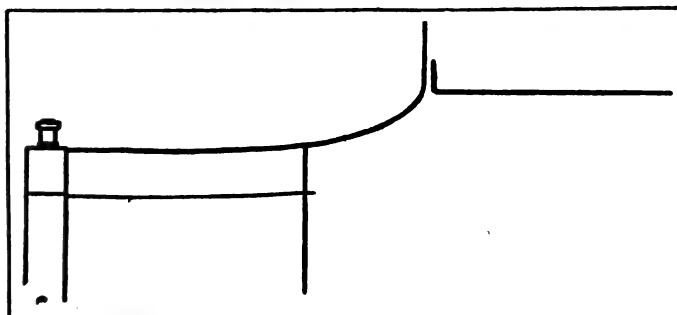


Fig. 2—Middle, Cowl and Body Lines Growing Out of Hood Lines.

BRICK PAVEMENTS.

The National Paving Brick Manufacturers' Association has issued a very comprehensive booklet on the construction of vitrified brick street pavements and highways. Several types are given in the specifications which cover vitrified brick paving of san-cement superfoundation and grout filler. The subject is treated exhaustively and a number of illustrations are used to show the various stages of construction and also examples of this type of road which have been in use for years and are still in excellent repair.

Copies of the "specifications" will be sent upon request to the National Paving Brick Manufacturers' Association, 830-834 B. of L. E. building, Cleveland, O.

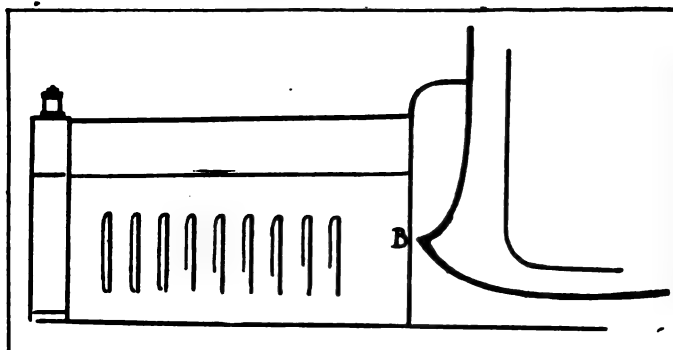


Fig. 3—Lower, Pointed Door or Body Hook Just Back of Hood.



W. B. Stout Testing Out the New Eight-Cylinder Scripps-Booth Car in the Colorado Mountains.

NEW YORK AND CHICAGO SHOWS.

More Than 100 Makers Draw Space for Exhibitions at Both Metropolises

At the meeting of the National Automobile Chamber of Commerce to draw for space for the annual automobile shows in New York and Chicago, over 100 automobile manufacturers were represented, including all the prominent concerns in the industry.

Practically every foot of space at both shows has been spoken for and it is assured that this season's exhibitions at the Grand Central Palace in New York, beginning Jan. 6 and at the Coliseum in Chicago, beginning Jan. 20, will be the largest and most successful ever held.

Space was allotted to the following well known cars: Willys-Overland, Buick, Studebaker, Dodge, Maxwell, Cadillac, Chevrolet, Chalmers, Austin, Kline, Reo, Oakland, Winton, Packard, Saxon, Hudson, Dort, Westcott, Briscoe, Anderson, Milburn, Woods, Ohio, Pierce-Arrow, Stearns, Chandler, Olds, Mitchell, Pathfinder, Hackett, Peerless, F.I.A.T., Auburn, Paige, Franklin, Moline, Cole, Velle, Premier, Lexington, Cunningham, National, Pullman, Glide, Briggs-Detroit, McFarlan, Grant, Allen, King, KisselKar, Hupp, Case, Scripps-Booth, Marmion, Monroe, Lozier, Elkhart, Nash, Consolidated, Inter-State, Regal, Mercer, Baker, Haynes, Stutz, Apperson, Moon, Empire, Lewis, Mutual, Paterson, Jackson, Crow, Davis, Standard 8, Liberty, Enger, Sterling, Harroun, Princess, Chicago, Drexel, Jordan, Monitor, Metz, Ben Hur, Dey, Elgin, Roamer, Emerson, American, Dixie, Classic, Kent, Sun. Doble Steam, Stephens, H. A. L.

Both at the directors' meeting and at

the members meeting there was considerable discussion of the freight situation, owing to the shortage of freight cars. It was reported that there are now 70,000 automobile cars in service, with 7900 more under construction. During the month of September car load shipments of automobiles totaled 21,660, as against 18,940 for the same month in 1915.

A favorable report was made by the Committee on Good Roads in reference to the campaign to stimulate interest in highway engineering learning and it was reported that one manufacturer had already established a highway engineering scholarship in one of the state universities.

The advocacy of obtaining uniform traffic laws throughout the country was supported by the members and a difference of opinion was voiced as to whether cars running north and south should have the right of way on the roads. Makers were also of the opinion that lights should be so regulated that the beam will not show more than 42 inches above the ground at a distance of 75 feet.

DIMMER DEMONSTRATION.

The results of the dimmer demonstration held by the Automobile Club of Hartford, Conn., at Charter Oak Park, at which 15 different devices were tested, gave the members some valuable data and information upon which to draw up a satisfactory measure for the legislature, which it is expected will enact

some kind of a dimmer law at the next session.

Secretary Arthur Fifoot reports that the test was an exhaustive one, a large screen being erected on which the height of the beams of light were gauged. Also the distance each side of the lens and ease by which objects were visible on the roadway were determined. Following this demonstration the committee in charge of the tests rode around the track in different cars going in opposite directions so as to obtain the effect when running toward the various headlights.

Among the devices used in the demonstration were: Corning Lenz, both white and amber; the Legalite; Warner Lenz; offset reflectors; Vosburg miniature lamp; Glare Off; Fracto Lenz; Beech Dirigible and Bermac and also the Locomobile car with standard equipment. Tests were made of several with different powered lamps.

It is not the intention of the committee to recommend any particular make of dimming device. They will offer the reports made on the tests to those who will have charge of drawing up the bill to regulate headlights.

SCRIPPS-BOOTH IN HARD TEST.

W. B. Stout of the Scripps-Booth Company recently returned from driving one of the new eight-cylinder Scripps-Booths a distance of 2100 miles in nine days, from Detroit to Salt Lake City. The actual running time was 66 hours and the daily average 293 miles. One day 327 miles were covered.

For the whole distance an average of 20 miles per gallon of gasoline was obtained, while less than two gallons of oil were consumed. The maximum speed made was 62 miles an hour, while one stretch of winding road of 25 miles was covered in 25 minutes. Neither the spark plugs nor the valves gave the slightest trouble during the entire trip.

Aside from the distance covered the car was sent over some of Colorado's worst and most precipitous motoring routes, including Pikes Peak and Berthoud's Pass. The pass, 1100 feet above sea level and 81 miles from Denver, was conquered in less than four hours running time over very poor roads and grades as high as 18 per cent.

Altogether the Scripps-Booth officials are decidedly pleased with the showing made with their latest product.

H. & N. FOR LANCIA.

The Lancia company, following a series of tests, have adopted the H. & N. carburetor as standard equipment. A special type for these cars is now being built by the H. & N. Company.

A new plant at Long Island City has been purchased by the H. & N. Company, which will double their capacity. The concern is also opening a large retail store at 1675 Broadway in New York City.

HOLLOW TILE GARAGE WITH STUCCO EXTERIOR



HAVING described the construction of a number of garages of the cheaper type in this series of articles on housing the automobile, a more elaborate structure will be dealt with, one of a style in keeping with a large single residence for maintaining one or more large cars.

The idea of an expensive garage, or even one that costs upwards of a thousand dollars, does not meet with much enthusiasm on first thought, but up to the time that automobiles became general in use an expenditure of from \$2000 to \$5000 for a barn was not considered extravagance, as it enhanced the value of the property. The entire equipment that was housed in this barn represented an outlay of less than \$1500, consequently it would seem that an outlay of this much would certainly be warranted to provide quarters for one or two large cars costing from \$1500 to \$2000, disregarding the improvement to the estate resulting from the addition of such a structure.

A Two-Story Garage.

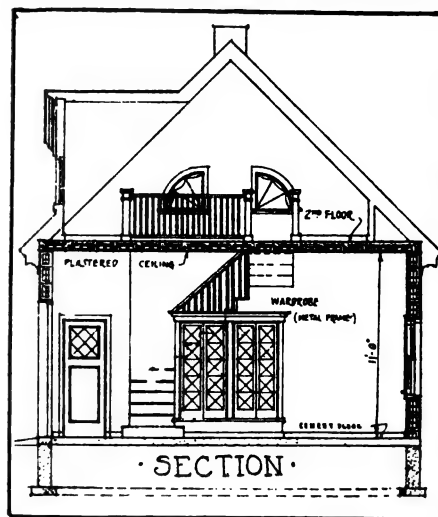
Leaving the matter of first cost aside the ownership of a well built garage with room for two cars, all necessary equipment and a tenement on the second floor, can be made to effect many economies besides affording conveniences that otherwise could not be obtained. The chauffeur's wages being figured on the basis of his services at ruling rates, minus the rental value of the tenement, this saving alone will amount to the interest on the investment. Furthermore, the chauffeur is handy at all times and his home being in the same building with the cars the latter are more likely to receive the proper care and attention than if the car were stored in a public garage or the chauffeur lived at some distance from the owner's private garage.

A substantial heating equipment can also be installed, making the building comfortable throughout the cold winter months, which is the logical time to carefully overhaul machines. If a competent man is employed a big economy is effected here also. He will keep the machine out of the repair shops. Either steam or hot water can be used for heating and the chauffeur need devote but little of his time to attending the plant.

The type of garage described is called "hollow tile stucco," the main structural material being hollow tile with three coats of stucco on the exterior and one coat of cement mortar on the interior. A concrete mixture is used in the foundation walls and floors, while the roof may

be built of either wood, with a shingled thatch, cement concrete or tile. The accompanying sketches show the construction of a wood roof, but where a thoroughly fireproof structure is desired it is better to use one of the other types mentioned.

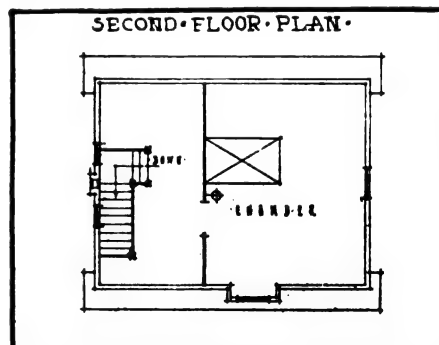
As shown in the plans the wall construction is a series of tier of hollow tiles



Staircase Leading to Second Floor.

laid with the cells running vertically. The cells in the tiles forming the corners are filled with concrete and reinforced with steel rods running from the foundation to the top of the wall.

The upper floor can be made of hollow tile also, setting the tiles in reinforced concrete with the cells running horizontally and using steel rods between them



Lay Out of Second Floor.

for reinforcement. The under surface forming the ceiling for the garage proper should be plastered with a cement mortar, while the upper can be finished with a fine cement or a hard wood floor can be laid. The latter makes the tenement more homelike and comfortable and does not increase the fire hazard to any extent, as it is not exposed to anything that is liable to blaze up.

Boiler Room Separate.

The boiler room should be separated from the garage room, as shown in plans, by the erection of a fireproof partition extending from the floor to the ceiling. This partition is easily constructed of a wire frame with wire lath to which a coating of cement mortar is applied.

The plans as shown in accompanying cuts should be carefully studied as to detail. Estimates as to cost can be made from them by most any dealer in masons' materials. The different formulae for making concrete, stucco, cement mortar and coloring stucco were all given in preceding articles on the construction of concrete and cement garages. These formulas, which will not be repeated owing to their length, were for standard mixtures with a Portland cement base and the proportions for mixing up the different materials should be carefully observed.

With the approach of winter care should be taken in mixing and using both stucco concrete and mortar, as heat hastens the hardening of Portland cement mixtures and cold delays it. At a temperature of 50 degrees Fahrenheit and lower the tendency of Portland cement mixtures to remain soft increases and if frozen before it sets it is ruined. For this reason concrete stucco and similar mixtures should be protected from freezing for from 48 hours to five days after it has been laid. It is also good policy when low temperatures prevail to heat the different ingredients for the mixtures as, by so doing, setting is not only hastened, but there is less danger of any serious injury from freezing if a sudden drop in the temperature takes place.

Owing to the fact that cement forms but a small proportion of the total mass in these mixtures, it is not necessary to heat it, but the water, sand or coarse aggregate should be heated. Water should be heated to 150 degrees either by inserting a pipe with a flow of live steam, or in a boiler over a fire. The sand, pebbles and stone to be used should be heated to a similar temperature, the heating being most economically accom-

plished by piling the material around an old hollow boiler or smoke stack in which a fire is built. After the mixtures have been laid they may be protected in various ways. Some builders entirely enclose structures with false work and keep a fire going within, but on small work tarpaulins, burlap bagging, straw or other materials that are accessible or handy to use can be employed in keeping the cold out and the heat in for a sufficiently long period for the cement to harden.

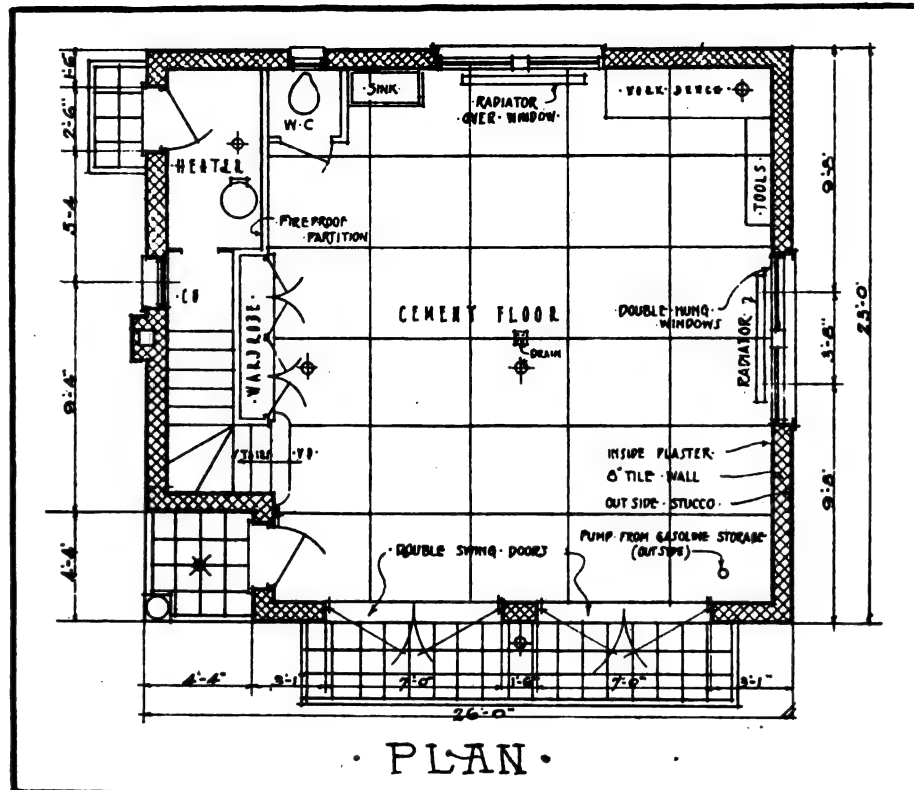
The tile walls make an admirable surface for stucco treatment, but should be thoroughly moistened before applied and for this reason care should be taken that there is no frost in either the tiles or stucco material when used.

With the completion of a building of this character the owner has all that the most fastidious motorist could desire in a garage without wasting money. The equipment should be in keeping with the building and should include a turntable, provision for the installation of which should be made while the floor is being laid, and at the same time proper drainage through a system such as has been previously described in this series should also be provided for.

A substantial work bench and small lathe should also be installed and a corner cabinet built for storing parts, tires or accessories not constantly in use. An overhead washing appliance is very handy, but is certainly not ornamental on the ceiling. On the other hand, however, washing with a hose from the sink faucets is an objectionable method at the best. Should the overhead apparatus be desired the pipes should be put in during the erection of the building to conceal the piping, as similar provision is made for the pipes from the gasoline tank located on the outside in connecting it up with the pump on the inside.

KENT MOTORS CORPORATION.

The Kent Motors Corporation, a newly formed organization, which has taken over the Kent Motors Corporation of New York, a wholesale and export organization, will soon start work on a large plant in Newark, N. J., for the manufacture of a new automobile to be called the Kent Car and which



Details of the First Floor, with Dimensions for Guidance in Construction with Suggestions for Rooms, Etc.

will sell for \$985.

The Kent car will have a wheel-base of 116 inches, with a Continental motor, 3½-inch bore, five-inch stroke. The radiator will be of the honeycomb type, and Timken axles and bearings will be used throughout. Two models will be made for the present, a five-passenger roadster and four-passenger club roadster.

F. H. Clarke, now president of the Kent Motors Corporation of New York, will head the new company. Other men identified with the concern are: Wallace A. Hood of Detroit, formerly general sales manager of Chalmers, Major A. White, New York financier; Thomas L.

Raymond, Mayor of Newark, N. J.; P. P. Dean, supervising engineer; L. A. Dairymple Percival, president of the British Amalgamated Paint Company; R. J. Cosgrove, formerly of the Ford Motor Company.

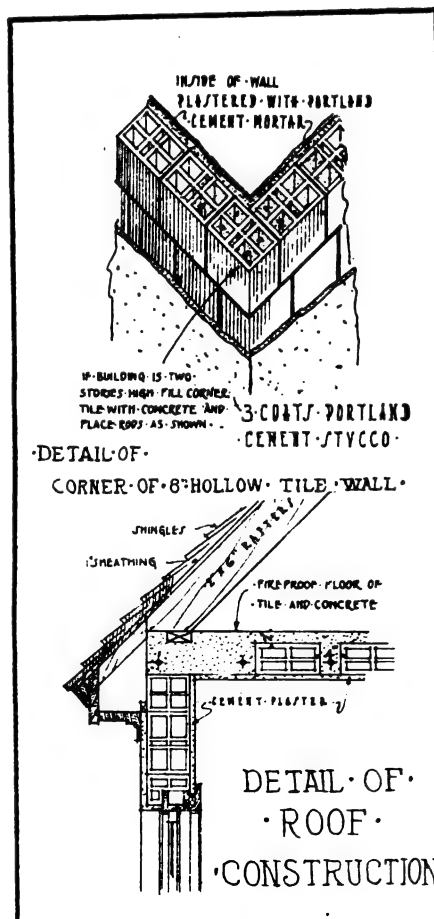
Lloyd H. Foster, formerly of the Hupp Motor Company and Briscoe Motor Company, will be manager of the export department. Alexander U. Conquest, formerly chief engineer of the Daimler Motor Works, will be the factory superintendent.

BRISCOE ON INDUSTRY.

"Looking Forward in the Automobile Industry," a pamphlet written by Benjamin Briscoe and issued by the Briscoe Motor Corporation, of which Mr. Briscoe is the head, is an interesting treatise on the subject of the "saturation point" in automobile sales. Besides supporting his argument with some very carefully worked out statistics, he makes the prediction that there will be about 5,000,000 automobiles in use by July 1, 1919.

CONNECTICUT NUMBER PLATES.

The registration number plates for Connecticut motorists, which will be distributed on and after Dec. 15 of this year, will have a white background with blue figures. Commercial cars will carry plates with blue backgrounds and white figures, while dealers plates will be marked with an "X" on a white background with blue figures and manufacturer's numbers will be on a similarly colored plate with an "M" prefix.



Roof and Foundation Details and Information for Builders.

1,200,000 MORE CARS PRODUCED.

Manufacturers Are Now Figuring On Enormously Increased Output for Next Year.

THE output of automobiles in the United States during the fiscal year ending July 31 fell short by about 20,000 cars of being double that of the corresponding period ending in 1915. The output this year is closely estimated at 1,200,000 cars, while last year the number was slightly in excess of 700,000 cars and 570,000 cars in the corresponding period of 1913-14.

Despite this enormous production the saturation point seems to be as far away as ever and the manufacturers are planning an output for the 1916-17 season which will show, it is expected, as great an increase as was made this year. There seems to be no let up in the demand and with unprecedented prosperity prevailing in every part of the country the manufacturers appear to be fully justified in banking on an expanding market.

The Ford company lead in production for the year just closed with 523,920 cars and the Willys-Overland company was second with 200,000, while the General Motors company with 123,000 was third and the only other concern to manufacture over 100,000 cars. The statistics gathered to date are not accurate, owing to the fact that the fiscal years of the various motor car manufacturers do not all end at the same time, although a majority of the large companies finish their year on July 31st. The following table gives the production of the various large companies in number of cars for 1916 and 1915, and the month ending the fiscal year:

Fiscal Period		1916	1915
Ford	.....July	523,920	308,213
Willys-Overland	.....Dec.	200,000	95,000
General Motors	.....July	123,000	76,000
Chevrolet	.....Dec.	96,000	20,000
Studebaker	.....Dec.	75,000	46,845
Dodge	.....July	60,390	*17,948
Maxwell	.....July	60,366	32,281
Saxon	.....June	25,399	12,000
Paige-Detroit	.....July	17,000	7,749
Hupp	.....Dec.	16,000	11,000
Chandler	.....Dec.	15,000	8,000
Mitchell	.....July	15,000	6,186
Packard	.....July	12,750	4,908
Grant	.....July	10,000	4,189
White	.....Dec.	8,100	.....
Haynes	.....July	6,700	3,780
Regal	.....July	5,500	3,897
Stearns	.....July	3,000	1,000
National	.....July	2,502	753
Stutz	.....July	2,000	1,079
Locomobile	.....July	1,747	1,436
Simplex	.....July	225	156

*Six months.

Several of the large factories have been remodeling to almost double their capacity. The Ford company, it is expected, will make between 800,000 and 1,000,000 cars during the coming season, while the Maxwell company plans to turn out 120,000 and the Saxon 45,000. Out of the General Motors total output of 123,000 cars during the past season, 80,000 were produced by the Buick com-

pany, which is planning to produce 122,000 in the 1917 season. The Packard company, which made 7750 pleasure cars and 5000 motor trucks up to July 31, will produce 15,000 cars the coming season, the Regal 6200, Stearns 5000, National 4800 and Stutz 4000. The Chevrolet company, which stood fourth in the list of producers, has scheduled for the manufacture of 150,000 cars for 1916-17 year.

In addition to this list there is a hundred or more other makers of gasoline propelled vehicles who are doing a prosperous business and who are constantly increasing their production.

NATALITE FOR AUTO FUEL.

The South African Natalite Motor Spirit Company of Natal, South Africa, has been incorporated with a capital of \$375,000 to manufacture natalite, which is a distillate of molasses, for use as an automobile fuel to compete with gasoline. This company expects to build a plant with a capacity of 6000 gallons a day.

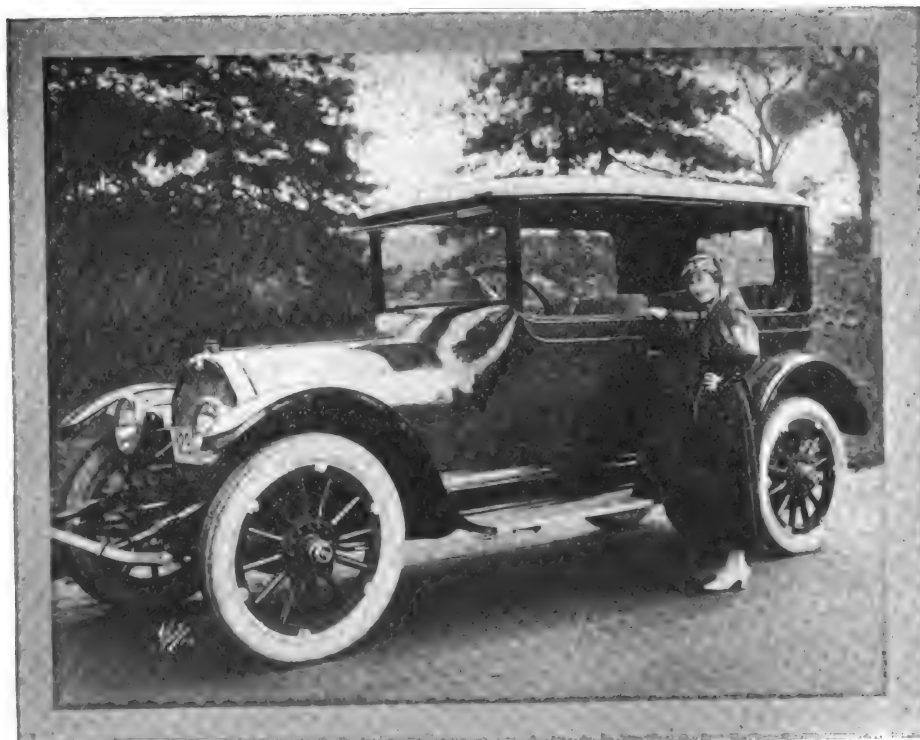
On a recent test made of the new fuel a 22 horsepower car, weighing 3600 pounds, was driven more than 500 miles with a consumption of 30.59 gallons of natalite, or an average of 16.4 miles per gallon.

FIRESTONE BOOK.

The Firestone Tire and Rubber Company of Akron, O., has issued a beautifully printed and illustrated book, which gives a wonderfully accurate illuminated description of "America's Largest Exclusive Tire Plant," as it is styled in the frontispiece, and also shows everyone in the organization, from H. S. Firestone down to the office boys. It is the most complete contribution to the literature of the trade that has been published to date.

Being extra large in size the many illustrations are exceptionally clear and full of detail, particularly the large centre piece showing all the Firestone factory employees gathered in front of the plant. The book also gives a running illustrated story of how the Up River Para rubber is turned into Firestone tires, through each process, and the machinery that works it are shown in operation in the most graphic style.

C. Arthur Benjamin, general sales manager of the Ross Automobile Company, in a recent address to the dealers of the company urged upon them the necessity of instructing purchasers not to drive over 20 or 25 miles an hour when they first take their cars out and that this speed should not be exceeded until a distance of at least 250 miles had been covered. This precaution should be taken, he said, owing to the fact that when new cars are shipped they are always "set up tight." He also stated that a plentiful use of oil in all working parts or where friction takes place was a safe policy at first.



A BEAUTIFUL CAR AND A BEAUTIFUL MAID.

The Car is the New Overland Sedan, a Striking "Job" Indeed; the Girl is Miss Marion Davies, Reputed to Be the Prettiest and Daintiest Actress in the Ziegfeld Follies, the Owner of the Sedan.

What Every Woman Likes to Know.

Pontine Is a New and Decidedly Smart Fabric, Coming In All Shades and Particularly Adaptable for Motoring Clothes.

ONE of the smartest fabrics to be found on the market for the feminine members of motordom is pontine, a new product that has found favor with the leaders of fashion in the world's capitals. As it now is being made up into millinery, coats, cloaks and dresses, pontine provides a distinctive costume that is appropriate for almost any outdoor occasion, and particularly for motoring.

The fabric resembles a soft and beautiful grained leather on the outside, while the lining may be a lustrous satin or similar material. It is ideal for blustery or rainy days and can be used by the girl who motors, golfs, rides horseback or walks.

Pontine is really an exquisite material and is the result of many careful experiments made at the E. I. Du Pont Company, the maker of the fabric. It comes in all shades and in some cases the pontine process is applied to brocaded satin with very desirable results. Such a handsome and adaptable material is certain to win the favor of women everywhere. It may now be purchased in some of the most exclusive shops of the metropolises. Because of its very recent debut, pontine is not yet very well known to the general public.

The material is light in weight, waterproof and comes in all colors. Any goods, including velvet, damask, linen, silk and satin may be pontined by the Du Pont process, and the result will be a garment or hat as luminous and pliant as satin. It can be had in a variety of weights.

As an instance of the popularity pontine has already won is the fact that many of the leading American actresses, always the first to adopt the new and desirable, are now wearing hats and costumes of the fabric. Charlotte, the wonder skater at the Hippodrome in New York City, enjoys the distinction of wearing a pontine skating suit. The stars and chorus at the Winter Garden, New York, are wearing motoring apparel in which this material predominates. One whole act of another theatrical hit is costumed entirely in pontine.

When the pontine process was perfected this fall the Du Pont company placed an order with C. M. Phipps, the exclusive New York milliner of the smart set, to design a dozen creations. These hats were placed on exhibition in Chicago and from there, where they made quite a sensation, they were taken to St. Louis and awarded to the 12 women shooters making the highest scores at the Grand American Handicap Tournament.

One of the model hats was a striking cockade shape of black pontine and faced with peacock blue satin. It was trimmed

with bands of wistaria and blue grosgrain ribbon and finished with a ribbon ornament in the same shades.

Another model was of shell rose, sail-or shape, flared in the back and finished with flat white flowers and bands of white grosgrain ribbon. A third model was of old rose pontine, faced with black panne velvet and finished with bands of gold and black braid. There was a stylish straight white brim sailor, faced with American beauty satin. Another was a Charlotte Corday sailor of hyacinth lavender, trimmed with cubist effect motifs. One striking model was of black velvet with crown of yellow pontine, with trimmings of black grosgrain and embroidery.

There were several jaunty little bonnets and toques that were extremely smart and modish. One was a little jockey bonnet of black and green and faced with green. Another bonnet was in brown, yellow and king's blue. A motor toque was made in black and white satin with trimmings of gold braid. The remaining bonnets were tangerine yellow and wine color, and a Phipps sailor of black and brown with bands around the crown.

On the opposite page are examples of pontine made coats and hats, they all being Phipps designs. The photographs of the coats, and the hat in upper right hand corner of the page, were supplied by Joel Feder, New York City, while the two at the bottom were submitted by the Du Pont Company of Wilmington, Del.

The close fitting Tam o'Shanter (at top of page) with its becoming head band of ruby velvet and the pontine coat with its "swallow up" collar make an ideal outfit for a blustery autumn day, whether it rains or shines. The rich shadings of Bordeaux red and golden brown give a touch of color most appropriate for the autumn season.

Rich in coloring and artistic in effect is the loose coat of pontine (upper left) with huge pockets as big as saddle bags. The big collar mounts high in the fashionable way and the cuffs turn over twice to show the satin side of the pontine. Smoke gray and purple is the beautiful combination used.

Smart hats and coats to match, like that in the centre, is fashion's latest suggestion. Ample in cut, loosely belted and with big collar and cuffs this pontine coat is certain to be very popular. Hats are snug and defy the speed limit law.

The golden brown pontine coat and hat shown at the bottom right is satin faced in Nattier blue, making a perfect combination for blonds. This outfit is strikingly fashionable and is appropriate anywhere, and most of all in a motor car.

Fall's Fads and Fancies.

For Both Men and Women Motorists.

A NEW and very attractive woman's sweater for chilly days is of angora-alpaca and in purple, it being trimmed with narrow bands of white angora which edge the cuffs and collar and form fuzzy ball tassels on the sash.

Another sweater that is distinctly unusual is a heavy black silk garment cut in Cossack coat fashion and trimmed with wide collar and cuffs of white ostrich feather, a three-inch band of feather also going around the bottom. The sweater is completed with a narrow silk sash tipped with black and white ornaments.

The man who motors will appreciate the new aviation sweaters, which come in any of four colors and are of a fine quality angora wool. The collar can be converted into any of three shapes and sizes. It can be buttoned moderately high, or well up around the ears, or completely over the head to form a hood.

For the man contemplating a late autumn camping tour the new buckskin shirt will be found very handy and comfortable. While rather expensive, it appears very well, being made in full army model, with bellows pockets. Another

"outdoor" shirt is of mercerized rep, made in the regular flannel shirt model and coming in tan.

The full, gathered coat, or the adapted raglan, for the woman motorist predominates almost exclusively this fall. In nearly all models the set-in sleeve with the point running over the shoulder to the neck has given way to the practise of dropping the yoke to form the upper part of the in-set sleeve.

A large number of women are using feather muffs and boas in place of fur for autumn touring. A striking model seen recently was a muff tied around the centre with broad band of velvet ribbon and finished with a big bow. The tourist wore a toque in which the color of the velvet crown matched the muff ribbon. Feather trimming to match edged the hat.

Plaid lined undercoats for men are being worn without the usually accompanying tweed coat over them. The eight-quarter crown English cap, made of leather to match the undercoat, is also finding favor. These caps have roll bands to turn down over the ears and neck, with a white elastic running under the chin.

Pontine Coats and Hats for the Lady Who Motors.



An Early Autumn Motor Coat Made of Pontine, in Smoke Gray and Purple Color Combination.



Smart Motoring Outfit of Dual Surface Material (Pontine and Lustrous Satin).

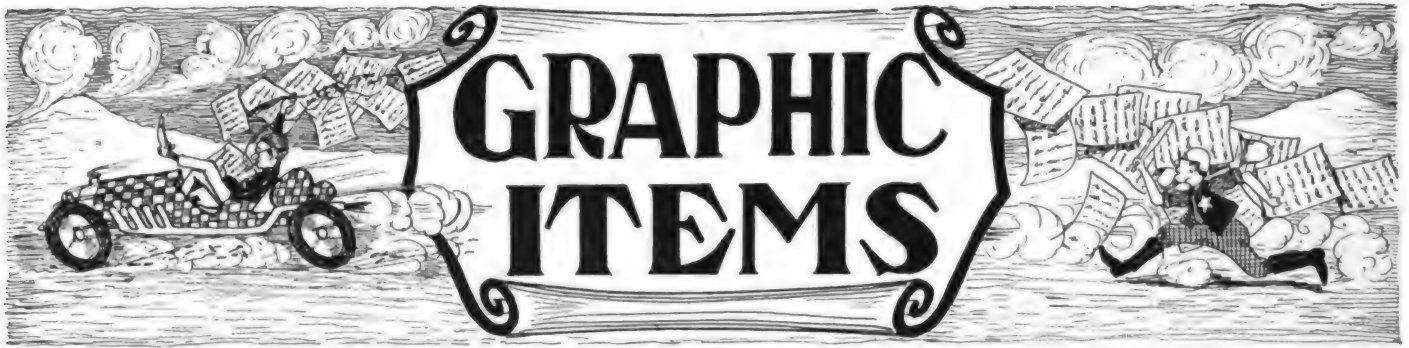


Close-Fitting Pontine Tam o' Shanter Cap of Bordeaux Red and Golden Brown. Coat with "Swallow-Up" Collar.

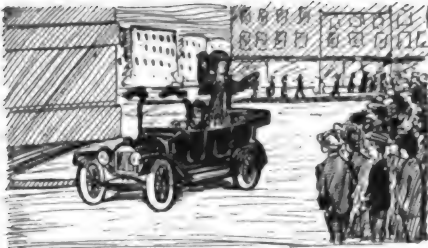
Motor Coat with a Leather-Like Effect, in Golden Brown. Pontine Hat in Nattier Blue.



Two of the Phipps' Hat Models Made for the Du Pont Company and Given to Champion Women Rifle Shots.



Miss C. Louise Boehringer, a candidate for the office of state superintendent of public instruction in Arizona, is making her campaign for office in a Ford car



which she has already driven 2000 miles securing votes.

The leading motorists of Medina county, O., have organized the Medina Automobile Club.

The members of the First Methodist church of Carthage, Mo., have purchased an automobile for their pastor to help him in making social calls at the homes of the parishioners.

A farmer in southern Rhode Island traded his motor boat for a motorcycle, which he later swapped for a Ford. He says he is satisfied now and has stopped swapping unless he can get a later model in trade for his present machine with nothing to boot, these terms having been religiously adhered to in his earlier dick-erings by which he became the proud owner of the said automobile.

The citizens of South Bend, Ind., have organized a movement to establish a volunteer motor car corps which will stand ready to serve the federal war department in case of the call for a quick mobilization of troops.

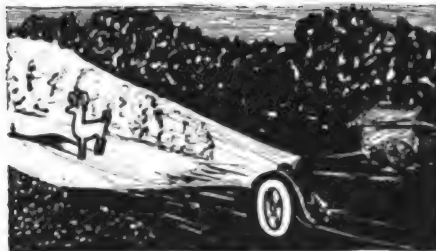
Amid a veritable efflorescent bank of rose bushes and other beautiful types of arboreal foliage, a motorist may drive for 18 miles outside of Los Angeles, Cal. Along this route there are over 50,000



rose bushes from four to six feet in height which scent up the atmosphere throughout the year. Most of these bushes were set out by individuals, but a city committee has been appointed to carry out the decorative scheme along many roadways on a more extensive scale.

The old joke about the man who was "dying to ride in an automobile" now is not a joke. In St. Louis those who die hereafter will ride in an automobile, the undertakers' association of that city having placed an order for \$51,000 worth of automobiles to be used both as hearses as well as the other vehicles which go to make up a funeral cortege.

The game wardens in Massachusetts have received orders to keep a vigilant watch for hunters who stalk deer from automobiles. Bay state game laws prohibit this practise. The attention of the

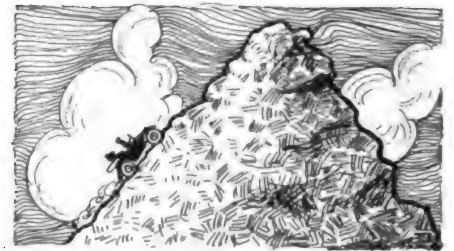


game commissioners has been called on several occasions recently to cases where motorists have been seen in the act of stalking deer with the headlights of their machines.

A judge of the probate court of Los Angeles, Cal., was obliged to hold court on the sidewalk, with his attendants and stenographer, in a case where the defendant, who had been driven to the court house, refused to leave the machine to appear in the court room. The defendant, a woman, was declared incompetent, that charge being brought against her by relatives who were appointed as guardians.

The family of Ex-Sheriff Joshua Cummings of Augusta, O., probably holds the record for the largest number of Fords owned, they possessing nine machines. The sheriff is still running the car he bought in 1909 and for which he paid \$1000. The other eight machines owned in the family are of a later edition.

A model 84-B Willys-Knight, with R. S. Neville of Dallas, Tex., driving was the first motor car to reach the top of Pikes Peak over the new roadway recently com-



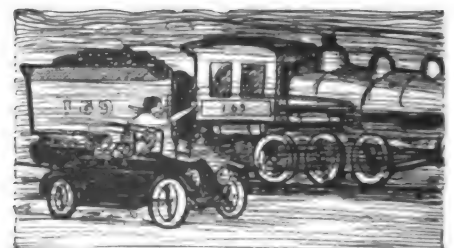
pleted. Of a total of nearly 1500 cars which started up the hill only a few attained the top.

The attorney general of the State of Wisconsin has given an opinion that a Canadian license plate is not sufficient for motor travel through that state and that the foreign owned cars must have a license either from Wisconsin or from states which have reciprocal license laws.

Figures compiled by officials of the Dallas, Tex., Automobile Club estimate the number of automobiles in actual use in that state on June 1 at 105,000. As compared with similar estimates on Jan. 1, the figures show an increase of 15,000.

A dry lake about four miles long and one mile wide, with a surface of salt and natural asphaltum, forming a perfect automobile race course, has been discovered between Victorville and Doble, Cal.

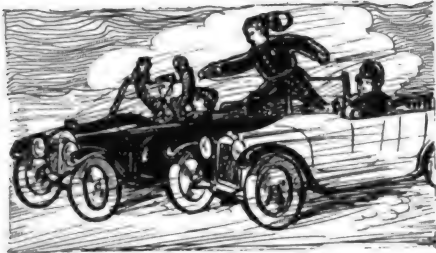
A spectacular rescue of a runaway locomotive, which was not staged for the movies, but was equally as thrilling as any of the hair raising stunts that are filmed, was accomplished by a 17-year-old girl near Tenino, Wash. The locomotive got away from the engineer when he got out to turn a switch and had gained a full head of steam when the situation



was noticed by Miss Ada Taylor, who was nearby in her Overland car. Picking up the engineer she went at full speed across the prairie until she had overtaken the engine and the running board of the car was near enough to the cab step of the locomotive to enable the engineer to make the leap aboard successfully.

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Chief of Police Gingras of Attleboro, Mass., apprehended two boys in a stolen automobile in that city recently under very spectacular circumstances. After a chase of over a mile he and Patrolman



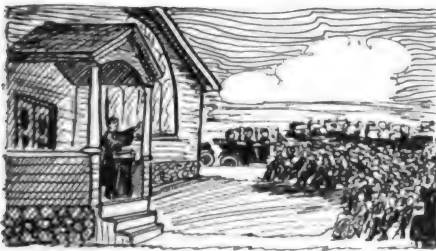
Aubrey overtook the speeding machine and the latter with drawn revolver leaped from the chief's machine into that of the escaping boys.

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The police courts throughout the country are reaping a harvest as a result of the strict enforcement of the automobile laws and ordinances. This sudden activity, however, on the part of the authorities is not in the nature of mere persecution, but is the result of organized effort on the part of automobile associations and others to keep the reckless motorist in his place.

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Rev. Orley L. Miller, a Congregational minister of Centralia, Kan., has found an efficient means of keeping his straying flock together. Most of his parishioners own motor cars and the temptation to go touring on Sundays was resulting in a marked diminution of Sunday attendance at services, consequently the Rev. Mr.



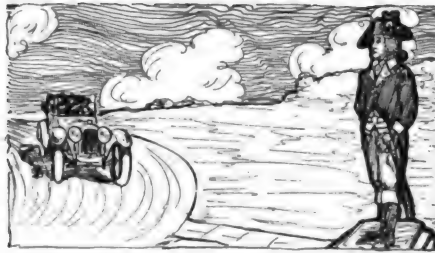
Miller decided to hold the services on the church porch so that the parishioners could drive up in their motor cars and participate without leaving their seats.

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Over \$4,000,000 has already been spent on the Lincoln Highway and an additional expenditure of \$20,000,000 will be necessary to complete it.

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A spot on the Lincoln Highway at Ft. Wayne, Ind., has been selected as a site for the new statue of Gen. Anthony Wayne, the famous Indian fighter and



founder of that city.

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The Bergen turnpike, the last toll road in New Jersey, which was built in 1802 by private subscription, has been taken over by the Board of Freeholders of Bergen county. It had four toll gates.

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In Vermont where there has been considerable complaint of the neglect of town selectmen in keeping guard rails up at dangerous curves and where there are deep gullies along side the roadways, it has been suggested that an expedient cure for this indifference to the safety of motorists would be found in free trips for the selectmen during which the drivers of the cars could race them at top speed around the neglected curves and



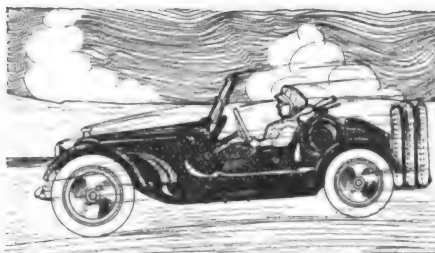
along the edges of roads where there are abrupt descents.

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John Look-Around, Jim Hunt-a-While and Sammy Sparkling-Water are in the automobile industry out in Detroit learning the ways and means of manufacturing Fords. The foregoing might sound like the beginning of a new Ford joke, but it isn't, Johnny, Jimmie and Sammy all being real Americans from the very oldest families, were formerly students at the U. S. Indian school at Carlisle, Penn. There are at present 50 Indians in the employ of the Ford company.

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Sarah Hewitt of Danville, Ill., who is nearing her 84th birthday, operates a 40-horsepower automobile, and when she is on the road she utilizes most of the power. She is way past all the other local automobile drivers in age and does



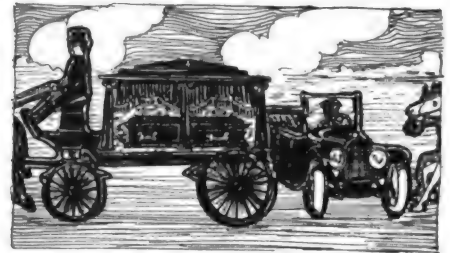
not intend to let them pass her on the road. She says years do not make people aged and professes to little respect for those who act old because they have lived a certain number of years.

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A large number of inquiries regarding conditions on the Lincoln Highway are pouring into the headquarters of the Lincoln Highway Association at Detroit, Mich.

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A resident of Laconia, N. H., was recently arrested for driving his motor car



through a funeral procession at Concord. He pleaded nolo to the charge when arraigned in court and a fine of \$5 was placed on file upon payment of costs.

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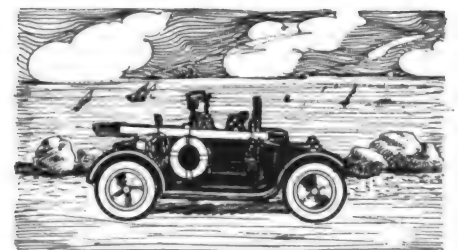
In Bridgeport, Conn., a new rule has been adopted which forbids motorists from parking their cars longer than 30 minutes in the streets in the centre of the city. When left for a longer period than this the machines are taken to the police station and the owners arrested.

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There is a healthy demand for pleasure cars, taxi cabs and commercial trucks in Bergen, Norway, which reflects the prosperity being enjoyed in that country since the war broke out. The machines now being imported by the dealers there are mostly of American manufacture, but Italian manufacturers are also sharing in the business.

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Probably the only life saving crew in

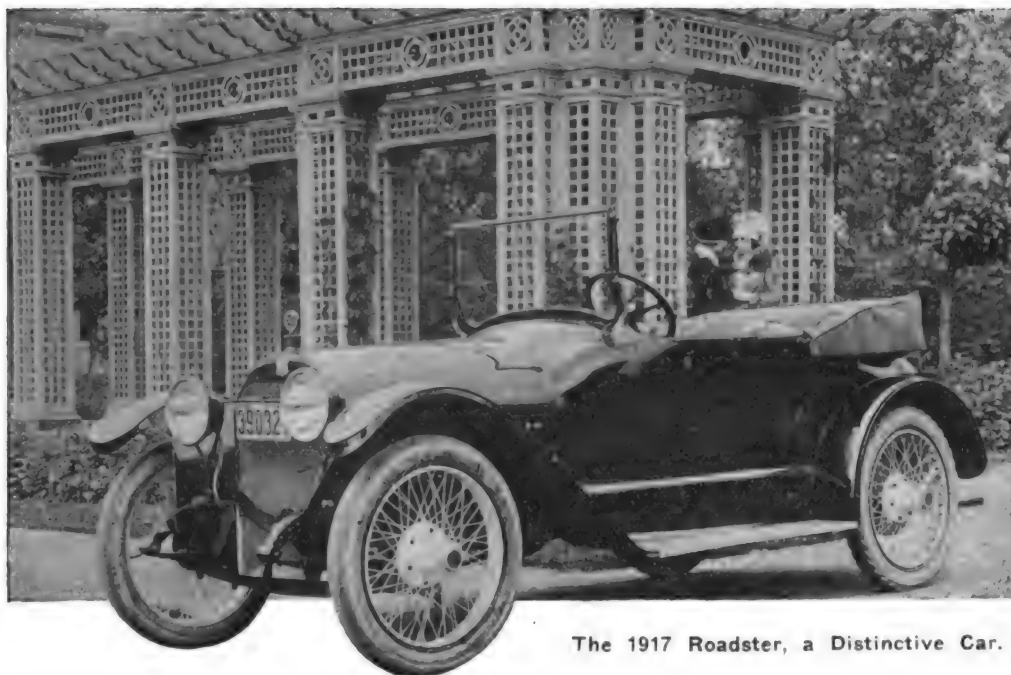


the world that is equipped with motor cars is that at the bathing beach at Santa Monica, Cal. The cars used are Fords and they carry a full life saving equipment for beach work, including life preservers, coils of rope and lung motors and have bunks along the side for ambulance work.

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In the Studebaker factories 11,000 men produced 37,000 automobiles in 1913, while the present force of 7000 men are producing at the rate of 100,000 cars annually.

Haynes Offers Light Six and Light Twelve.



The 1917 Roadster, a Distinctive Car.

Both Motors Are Mounted In the Same Chassis, Permitting Great Manufacturing Economies—Six Much Improved.

THE Haynes Automobile Company, Kokomo, Ind., has by mounting a 12-cylinder motor in its six-cylinder chassis evolved the Haynes "Light Twelve," and in this has for 1917 a six and a twelve. The economies effected relate largely to the production end. Both models are very similar as to body lines and exterior appearance.

Particular attention has been paid to obtaining lightness in the new motor, and for that reason the model has been dubbed the Haynes "Light Twelve." The reciprocating parts are noticeably light, but strong, and throughout care has been taken to meet the requirements of a high speed engine. The cylinders are cast in two sets of six and have removable heads with valves in the head.

The chassis has a wheelbase of 121 inches and a turning radius slightly under 21 feet. Both the six and twelve carry a four-passenger roadster body with Hartford shock absorbers, Goodyear Cord tires and wire wheels as regular equipment.

The front seats of the roadster are divided, with wide aisleway. The rear seat is wide enough for three persons when desired, they having plenty of leg room by reason of the front seat back being sloped downward toward the brake and clutch pedals. The body is hung low and evenly balanced, the running boards having a clearance of 10 inches.

The comfort of the driver has been given special attention. The brake and clutch pedal pads may be pushed away or brought closer, according to the need,

and the driver's seat may be moved either forward or backward. The controls are within easy reach, and the cowl instruments are on an instrument board.

The 18-inch steering wheel, which is heavily notched and highly polished, is rigidly supported in passing through the cowl apron so that no vibration can be transmitted to the arms. The foot accelerator moves vertically.

The Haynes "Light Twelve" motor has bore of $2\frac{3}{4}$ inches and stroke of five, with total piston displacement of 356 inches. The horsepower is rated by the S. A. E. formula at 36.3. The two-cylinder blocks are set at an angle of 60 degrees and with the other parts form a compact engine. The exhaust manifold is on the outside of the V and permits

the exhaust pipe to be brought directly out of the centre, and straight down and back under the car.

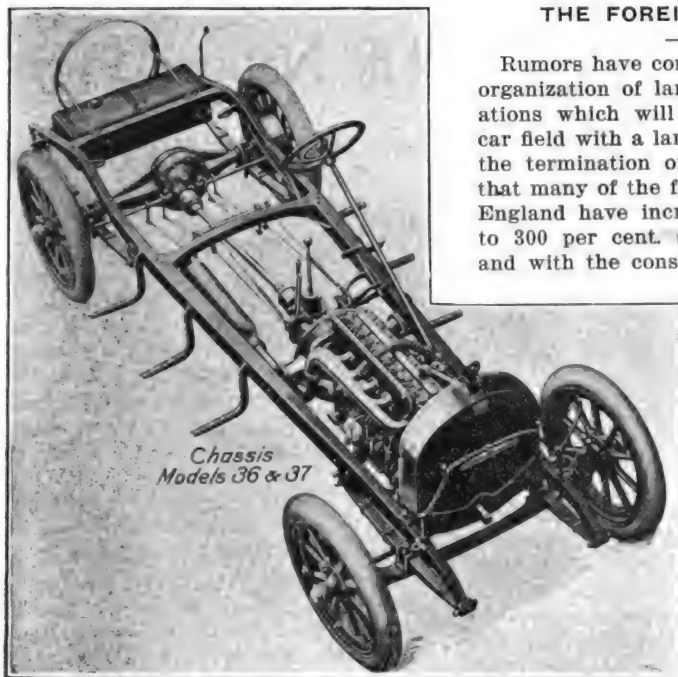
The valve in head V type motor makes for a convenient arrangement of all accessories. The water pump, generator and air pump are in accessible locations along side the motor and the regulations that the wear of service makes necessary can be made readily. The carburetor is placed in the V alley, midway between the two blocks and is hung from the short manifold. Between the blocks also is the ignition installation, the timer and distributor. The intake manifolds are surrounded by hot water jackets to prevent condensation of the fuel before it reaches the combustion chamber.

The crank case is the split type with all the crankshaft bearings carried in the upper half, which is of aluminum. The lower section is seamless pressed steel and cast as the oil reservoir. The oil is kept at a low temperature by the air striking the reservoir direct. Instead of using a mud pan, the pressed steel section is fitted tightly between the motor and car frame to overcome likelihood of squeaks and rattles. The crankshaft is a carefully balanced three bearing drop forging. All told the "Light Twelve" motor weighs less than a hundred pounds more than the Haynes "Light Six."

The pressure feed lubrication system is used, the oil being sent through the hollow crankshaft by gear pump and thence to all the bearings reached by the crankshaft leads. The other bearings and working parts are reached by

FEATURES OF THE HAYNES "LIGHT TWELVE" FOR 1917.

Motor, 12-Cylinder V.
Bore and Stroke, $2\frac{3}{4}$ by 5.
Horsepower (S. A. E.), 36.3.
Piston Displacement, 356 Inches.
Lubrication, Pressure Feed.
Cooling, Pump Circulation.
Ignition, Delco Two-Unit.
Carburetor, In V Alley.
Fuel Feed, Vacuum.
Starting and Lighting, Leece-Ne-ville.
Clutch, Three-Plate Dry Disc.
Gearset, Three-Speed Selective.
Rear Axle, Full Floating, Haynes Make.
Wheelbase, 121 Inches.



The Chassis is a Rugged but a Neat "Job."

small oil pipes.

The "Light Twelve" electrically considered resembles the "Light Six." Starting and lighting are by the Leece-Neville system, while ignition is a two-unit Delco installation. The generator and motor of the starting and lighting system are separate units, the motor having the Bendix drive off the flywheel. There is an automatic circuit breaker to take the place of fuses, the breaker opening automatically when there is a short circuit in the system. To resume the circuit it is necessary only to press a button.

A three-plate dry disc clutch, completely enclosed in the flywheel, is used on both the Six and Twelve. The transmission gearset is the three-speed selective type, the shafts being carried on large Gurney ball bearings. At each end of the propeller shaft is a universal joint.

The full floating rear axle is entirely a Haynes job. The differential is so constructed that it can be lifted out in unit after removing only four nuts that hold the bearings, and without removing the axle. Mesh between the large ring gear and the driving pinion gear can be adjusted easily. The drive gears are spiral bevel. Both sets of brakes are of the expanding type and are set side by side on the inside of the 14-inch drum. Thus they are completely protected from mud. Adjustment to compensate for wear can be made from the outside.

The front axle is an I beam section, caster type, the front wheels running on two sets of ball bearings which have both a thrust and radial component. Both the Six and Twelve four-passenger roadster, like all other Haynes body types, are supplied with full equipment customary on the up-to-date cars, and the standard colors are Brewster green with black running gear.

The price of the "Light Six" four-passenger roadster is \$1585; that of the "Light Twelve" roadster \$2085.

THE FOREIGN INDUSTRY.

Rumors have come from Europe of the organization of large automobile corporations which will enter the low priced car field with a large scale production at the termination of the war. It is said that many of the factories in France and England have increased their output 30 to 300 per cent. since the war started and with the consolidation of several of

these, similar to the mergers already made in this country, would enable a production equal to that of a number of the large factories now operating in the United States.

Should foreign manufacturers undertake production on a huge scale it would mean a greatly increased demand in this country for parts and materials.

At present the demand here is so great it is taxing the sources of supply to the limit almost. It is understood that there are already in this country many representatives of European manufacturers who have come to look the field over with the object of determining the possible sources of supplies of materials, machinery, etc., that would be necessary in production on a large scale in the plants abroad.

Dont's for Drivers of Cars.

Police Captain, in Charge of Lost Cars, Gives Some Valuable Advice for Owners and Drivers of Cars.

Captain Patrick F. King, who is in charge of the lost car department of the Boston police department, has prepared a list of "dont's" for automobilists who wish to prevent their cars from being stolen. He also, as a result of the nature of his occupation, has formed some distinctive opinions regarding the case of the stolen car. Finding that 369 of the 370 cars stolen in a year belonged to the comparatively poor men, Captain King said, "the thief in making his selection must choose the car of the lowest upkeep. Therefore the 'poor' man with his so-called 'tin Lizzie'

must be the victim. Incidentally, small, cheap cars may be run from 18 to 22 miles on a gallon, while the rich man's powerful machine will consume a gallon every eight or 12 miles."

"Nearly 60 per cent. of the cars stolen are kept for personal use," he said. "Another 30 per cent. are stolen by boys, who, having an idea they can operate a car, become 'desperate' to drive. It is easy to dispose of the other 10 per cent., for it is almost impossible to identify a stolen machine.

"The game is to remove the maker's name plate and to change the engine number, a trick easily performed. If there is no concealed mark, by which the owner can recognize his car identification is almost impossible."

The following list of "don'ts" prepared by the captain are bound to be productive of good results if carefully observed:

Never leave your car in the street without placing a good lock on some part of the mechanism to prevent its being started.

Don't leave valuables in the car unguarded, as it is a temptation for others to steal.

Because your machine is insured against theft, fire, etc., don't be careless with it, for by doing so you place the insurance company's property in jeopardy.

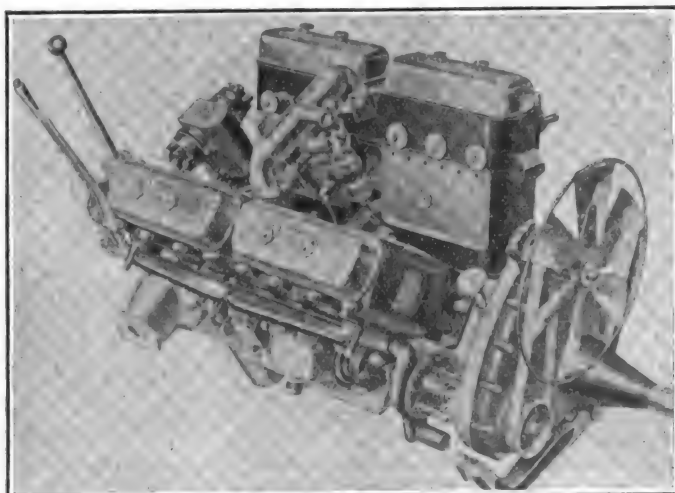
Have a distinguishing mark on one or more concealed parts of your car so you may be able to identify it if stolen.

Note the motor, maker's and registration numbers, as well as the model of your car so that if the car is stolen you can give the police a proper description.

When leaving your car unattended, especially in residential sections, note a description of any person loitering in the vicinity.

Do not purchase a car that a motor number is disfigured or removed, as that is strong evidence it is a stolen car. Report such cars and their owners to the police.

A Direccion General de Caminos, which means road bureau in English, has been created by the National Assembly of Salvador. This bureau will take up the work of improving road conditions in that country.



The Valve-In-Head Haynes Light Twelve Motor.



The Seven-Passenger Touring Model.

THE National Motor Vehicle Company of Indianapolis has made several improvements in its Highway 12-cylinder models for 1917, notable among which is the seven-passenger touring car, which takes the place of the six-passenger job of last year. The National company also continues production of the Highway Six, which met with remarkable popularity during the 1916 selling season.

The National Twelve has now been on the market for about a year and a half, having been introduced in May, 1915. The 1917 model is a bigger and even better car, and, in keeping with the general trend of the industry, is selling at an advanced price. This year it is offered at \$2150, which price includes the extra seats provided with the car. Last year the price was \$1990, with an extra charge of \$30 each for the extra seats. The Six model sells for \$1750.

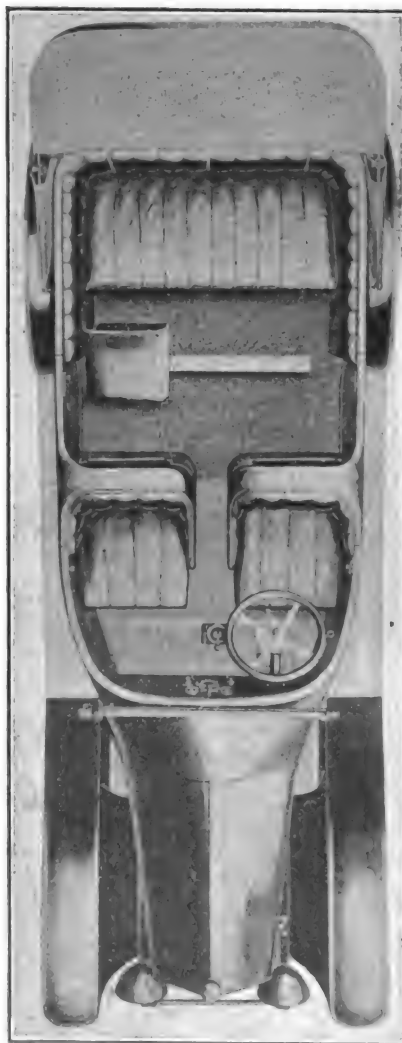
Several improvements of details are noted in the new Twelve. The same general chassis job on the 128-inch wheelbase is continued, and the regular tire equipment is 34 by 4½ inches, instead of the option of last year between 34 by 4½ and 36 by 4½. The National company found the first mentioned size the most popular in demand and consequently has concentrated upon it as standard.

While the chassis remains the same in length, the body has been extended three inches and made wider. Seats are larger in every dimension, the front set having an aisleway leading from the tonneau to the driver's compartment. More carrying capacity has been provided for under each of the three seats, and the tool compartment in the left front door is retained as a distinctive and convenient feature. In the tonneau under the centre cowl are two locked package compartments.

The new Highway Twelve model is furnished with five different body styles, a seven-passenger and a four-passenger touring car, a four-passenger roadster, a five-passenger all-weather sedan (Springfield type) and a three-passenger coupe. In the open models there is a new design of side curtains, and these are fitted to the doors and so arranged as to permit the curtains and doors to open in unit, providing a closed car effect that is ap-

preciated in cool and rainy weather. The tonneau floor is smooth and the supports of the folding seats are fitted flush when the seat is folded away.

Among the other equipment and body refinements are a new and specially designed tire holder in the rear, requiring the use of only one strap, and equipped with a tire lock, the removal of the gasoline filler to right hand side near the rear fender, a new oil pressure gauge on the



Showing the Arrangement of Auxiliary Seats, and the Roomy Compartments.

The National Highway Twelve Refined for 1917.

dash and a combination ignition and light switch which is locked by a special key, the keys not being interchangeable.

The radiator is still characteristically National, it retaining the shield design which has become so familiar on the highways. The size, however, has been changed, it now being two inches higher and two inches narrower, which makes the hood proportionately higher.

The exterior of the car shows further refinements. There is a new slanting windshield, and the tumble home type of body lines have given way to straight sides. The fenders are one inch wider and of a new design in the rear.

The cloverleaf roadster has been made into a full four-passenger job, the rear seat being moved back four inches. The back of the seat has been made higher, making it fully as comfortable as the front seats.

As said before, the chassis details remain practically the same as last year. The 2½ by 4¾-inch, 12-cylinder motor is made in the National shops, and consists of separate blocks of six cylinders each, both blocks being L head type and having two separate camshafts. Outside valves are used, and the electrical apparatus and other motor equipment set between the blocks and can be easily reached.

In the National lubrication system the oil is practically all fed under pressure, the feed being regulated by the supply from a gear pump located in the oil base. The National system does not employ dip troughs, the oil passing through the crankshaft, which is amply drilled for the purpose, and reaching the lower ends of the connecting rods from the main bearings. The timing gears and the camshaft bearings are lubricated through separate pipes. The oil is fed to the piston pins through tiny holes drilled in the aluminum pistons, the lubricant being lifted to the holes by means of a V groove cut near the bottom of the pistons.

In the cooling system there is a single duplex internal water pump, with two sets of vanes, one of which delivers direct to the right hand block and the other to the left through a passage cast in the aluminum crank case.

An aluminum cone clutch with leather facing is used. The shafts of the unit three-speed gearset run on annular ball bearings, and the tubular propeller shaft carries two universals. The drive is by spiral bevel and the direct gear ratio is 4.4 to 1.



The Twelve-Cylinder, $2\frac{3}{4}$ by $4\frac{3}{4}$, National Made Motor.

The rear axle is full floating, with taper roller bearings used throughout. The rear springs are of the flat cantilever type, the centre bracket having the swivel pin beneath the spring rather than above. Eight leaves are used and the length is 51 inches, with a width of $2\frac{1}{2}$ inches. The front springs are 38 by two inches.

YELLOW GOGGLES.

All motorists who do a great deal of driving do not appreciate the value of a well made pair of goggles with either amber or green tinted lenses. It is not necessary that they be of the expensive type, any pair with a good sized lens will answer the purpose of keeping the dust and strong wind from entering the eyes and will also relieve the strain of gazing into the strong sunlight if they are slightly tinted with either of the colors mentioned.

ELECTRIC WHEEL CHAIRS.

The electric wheel chairs that made their appearance at the Californian exhibitions last year gained so much popularity that their use has been extended to many places since the big fairs closed. They are now a common sight at the pleasure resorts in California and Florida. Being safe in the hands of both women and young people, little danger attends their use. Some are limited in speed to four or five miles an hour where they are to be used for riding on board walks, but for use in parks and less congested areas they have a speed rating up to 10 miles an hour. The majority are capable of running 20 miles on one charge of the battery.

THE FIRST PNEUMATIC TIRE.

The pneumatic tire, as an American institution, has attained its 20th birthday, having been first manufactured and used in 1896, when four were manufactured by the Goodrich company for Alexander Winton of the Winton Company of Cleveland, O.

Mr. Winton had wished his first experimental car that year and in looking about for suitable tire equipment hit upon the idea of having the machine fit-

ted with pneumatics, larger, but of the same type as were used on bicycles. He gave Arthur J. Wills of the B. F. Goodrich Company an idea of what he wanted and Mr. Wills in turn explained the proposition to B. F. Work, then superintendent of the Goodrich company and now its president.

The tires were delivered in October of 1896. They were of the single tube type, like bicycle tires, and those for the front wheels were 34x4s and for the back 36x4s. So far as is known they were the first pneumatics ever used on an automobile manufactured in this country. They were at least a great novelty at the time and hundreds of people gathered about the Winton that "rode on air" whenever it stopped in the streets of Cleveland.

John Harriott, the man who fitted the tires, is still with the company in the capacity of manager of the tire department.

Ray Harroun's Pressed Steel Car.

New Harroun Corporation to Build a Car
Consisting Almost Solely of
Pressed Steel Parts.

Ray Harroun, the well known racing driver and automobile engineer, who designed the Harroun car that is to be built by the Harroun Motors Corporation, a \$10,000,000 concern, says that the car of the future will be built almost solely of pressed steel, a type of construction which he has employed extensively in the new Harroun design.

This car, according to the designer, will contain a greater proportion of pressed steel than any car on the market. He also intimates that there will be important developments in pressed steel manufacture and that the products of dies and presses will largely displace such materials as gray iron, malleable castings, aluminum, wood, brass, bronze and a large proportion of the forgings now used.

"We have already solved the problems attendant on the manufacture of our frames, radiator shells, hoods, fenders, running boards, hub caps, rim carriers, crank cases, oil pans, instrument boards, clutches and clutch housings from pressed steel," Harroun declares.

"The Harroun bodies will be built of pressed steel panels. Our rear axle construction goes a good deal further than anything else in its line by utilizing

pressed steel parts throughout its housing. All the brackets and supports throughout the car are of pressed steel. We have made wide use of pressed steel even in the motor."

ALLEN WINS FIRST PRIZE.

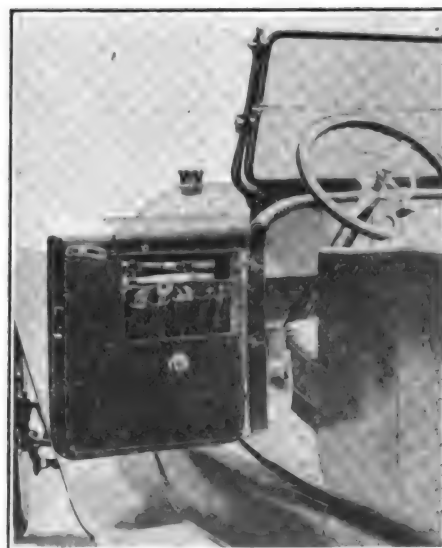
An Allen "Classic," manufactured by the Allen Motor Company of Fostoria, O., was awarded first place in a field of 20 different makes of cars which were placed in competition for the favor of the attendance at the Delaware county, O., fair recently.

General appearance, beauty of body design and finish were taken into consideration in judging the cars, which were driven slowly about the race course. The Allen "Classic," which won the honors, is one of the new creations of the Allen Motor Company and while having a special finish is mechanically the same as the standard Allen "37." It is an exceptionally attractive car in either of the three shades, classic brown, classic blue or classic gray.

SANTA MONICA RACES.

A good field of starters has been assured for the Vanderbilt Cup and Grand Prize races to be held at Santa Monica, Cal., in November. Considerable interest is manifest in the outcome, as in addition to \$15,000 in prize money, the races carry a total of 1900 points toward the award by the American Automobile Association of the title of "Champion Driver" and the \$13,500 prize money of the Goodrich and Bosch companies.

Paul Derkum, manager of the events, states that 35 cars will start. The Vanderbilt Cup race will be a class E event, non-stock, open to any motor car of 600 cubic inch displacement or less with a minimum weight of 1600 pounds. The Grand Prize will be a class D, non-stock free-for-all over a distance of 403.248 miles. The distance for the Vanderbilt Cup is 294.035 miles.



Tool Compartment in Left Front Door.



HOLMES WRECKING TRUCK.

The Holmes wrecking truck is designed to meet the demands of the garage man for a rapid jack and a wrecking truck. It consists of a rigid and well braced frame mounted on two wheels, having generous hubs, containing Hyatt roller bearings. The wheels are reinforced with webs and are of a size suitable to easy pulling on rough roads. The frame and wheels are made of malleable steel castings and are practically indestructible. Arranged to fit into this frame is a long tapered, detachable tongue made of second growth ash, heavily ironed, so that it can be used as a pry, in which case the wheels and frame act as an ideal fulcrum. There is also furnished an axle rest, adjustable to any shape or size axle, either front or rear. This is an apparatus that nearly every garage owner has use for and when it is needed it is needed badly. With it a car may be almost instantly jacked up for tire changes or wheel repairs. Two of these make a combination that is sure to make most any wrecked car available for towing into the shop. The weight of the truck is about 158 pounds.

Made by Robert Holmes & Bros., Danville, Ill. Price, \$30. Write for illustrated literature.

PURITAN GREASE GUN.

The outstanding feature of the Puritan quick filling grease gun is the removable inner tube and plunger, which allows the person using the device to scoop up the grease or fill it in any other way that is most convenient. Our illustration indicates the operating principle clearly. The maker makes claim to wide range of application, rapidity of action and cleanliness of operation.

Manufactured by the Puritan Manufacturing Company, Bridgeport, Conn. List price, \$1.50.

TWOMBLY FOOT PUMP.

This pump is designed to give greater effect with less exertion. The principle employed is that of leverage. The lever makes each downward stroke of the foot give greater force to the piston, resulting in easy downward strokes with multiple air pressure. The pump is connected to the valve by means of a special attachment which locks the pump connection to the tire valve, holding the same regardless of the amount of pressure

forced into the tire. To operate the pump it is set on the ground or floor and an up and down motion exerted upon it by foot, without bending the body and without over-exertion and fatigue. Its size, 17 by 3 inches, makes it convenient to pack away in the car. There are no parts about it liable to become easily broken through regular hard work. The pump is fully guaranteed.

Made by the Schlesinger-Redburn Corporation, 1834 Broadway, New York, N. Y. Price, \$4.50 each.

WIRE ROPE TOW LINE.

Owners and operators of motor cars can at slight expense fortify themselves against road troubles and delays by equipping their cars with a tow line. Illustrated herewith is an Excelsior wire rope tow line, which is made of steel wire rope, each end being formed into an eye-splice containing a thimble, which holds a drop forged sister hook. Capacity of the tow line is rated at about three tons and the length of the line is 25 feet. While the tow line is strong enough to pull any car out of trouble, it is light in weight and easy to handle and may be neatly packed in a canvas bag furnished for the purpose and put away in the tool box or under a seat. Included in the outfit are two Manilla slings for attaching the ends so as not to mar paint or do other damage.

Made by Wright Wire Company, Worcester, Mass. Retail prices, touring car size, \$3.75 complete; truck size, \$6.50 complete.

HARTFORD AUTO JACK.

This jack is made for the motorist who appreciates quality of construction, ease of operation and long, satisfactory service and is willing to pay a little more for these advantages. It is unusually easy working, due to the ingenious arrangement of the gears, which multiply power to a remarkable extent. It is claimed that a pressure of 15 pounds applied to the handle develops a thousand pounds of lifting power on the rack. It should then lift with ease the heaviest of cars because the weight of few, if any, is ever this much on one of the four wheels. It is built of the best of materials and intended to give a long service. Finished in black enamel and furnished in a handy canvas bag.

Made by the Edward V. Hartford, Inc., Jersey City, N. J. Price, \$6.50.

APCO BREATHER.

A new Apco breather pipe for Ford cars is now being manufactured. This device not only simplifies the renewal of oil supply, but eliminates the disagreeable spraying of oil over the engine and inside of the hood. It is provided with a fine screen to strain the oil and prevent the entrance of foreign matter into the reservoir. A feature of this new accessory is a hook which fastens around the timer bolt. This hook, being integral with the breather, holds it firmly in place and makes the removal of the cover an easy matter. The Apco breather is nicely finished and should prove a valuable feature.

Manufactured by The Auto Parts Company, Providence, R. I. Price, 50 cents each.

STEERLITE BRACKETS.

Steerlite headlight brackets are designed to take the place of the rigidly attached type and to enable one to turn the headlights automatically and simultaneously with the turning of the front wheels. They may be attached by anyone, being supplied with fittings, connections, bolts, etc., and are suitable for either electric or gas lights. The cone bearings for the brackets and the ball joints in the rods insure no increase in steering resistance in the operation of the Steerlite brackets. In fact, the joints absorb all shocks, eliminate wavering and oscillation and afford true and steady illumination. It is claimed that these brackets offer immunity from many of the dangers attendant upon night driving.

Made by the Motor Products, Inc., Stamford, Conn. Price for Ford car set, \$12; for other cars, \$15.

VICTOR HORN.

This is a low priced electrically operated horn of the vibrator type, designed to give a large volume of noise with a small consumption of current. To meet the demand for a good cheap horn it is built on pleasing lines and has a tone that is both positive and insistent, tending to clear the road instantly. It may be had in a variety of finishes, including all black, black and brass or black and nickel. It comes complete with necessary bolts, push button and 10 feet of insulated cord.

Made by the American Electric Company, Chicago, Ill. Retail price complete, \$4.



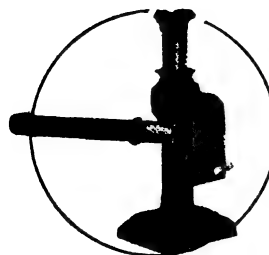
Two Views of the Twombly Foot Pump,
Made by the Schlesinger-Redburn Corp.,
New York City.



Excelsior Wire Rope Tow Line,
Made by the Wright Wire Co.,
Worcester, Mass.



Apco Breather for Ford
Cars, Made by Auto
Parts Co., Providence,
R. I.



Hartford Auto Jack and Its Cover, Made by
Edward V. Hartford, Inc., Jersey City, N. J.

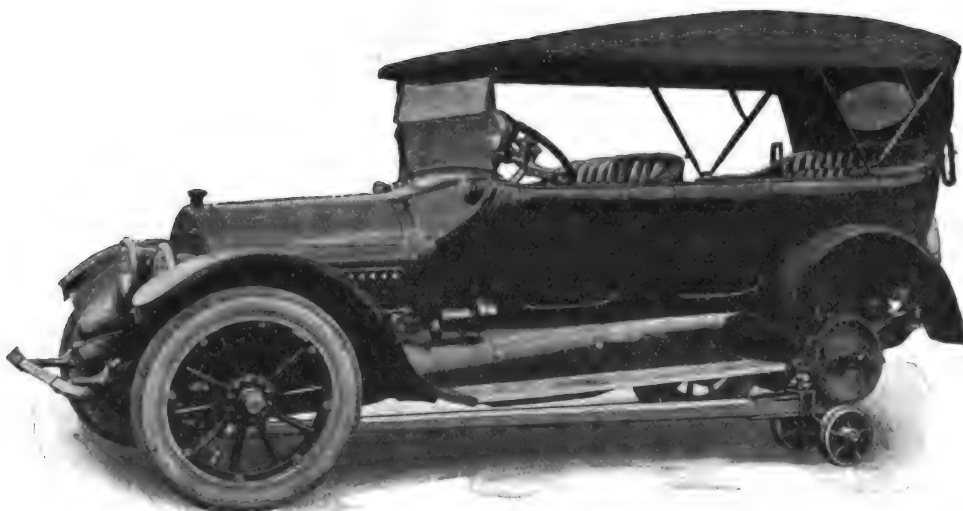
The devices illustrated here and described on the opposite page are decidedly worth investigation. If they are not to be had at the local accessory store, a postal card to the manufacturer will bring complete details to the inquirer. The descriptions on the opposite page are, of necessity, brief, because of limitations of space. However, sufficient information is given to enable the reader to understand the outstanding facts concerning each device. When writing to the manufacturers it is advisable to mention that you saw a description of his device in this magazine. It helps the manufacturer, the magazine and yourself.



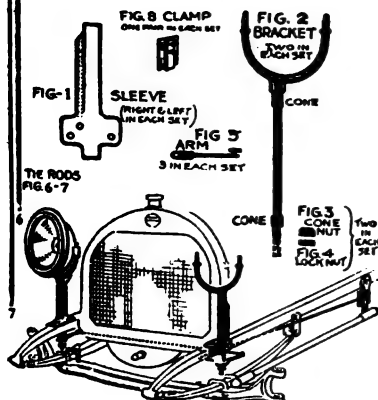
Victor Horn, Made by the American Electric Co., Chicago.



Puritan Grease Gun, Made by
the Puritan Mfg. Co., Bridge-
port, Conn.



Holmes Wrecking Truck and How It is Used to Convey a Damaged Pleasure Car;
Made by Robert H. Holmes & Bros., Danville, Ill.



Steerlite Headlight Brackets, Made
by Motor Products, Inc., Stamford,
Conn.

TO HARMONIZE TRAFFIC LAWS.

A. A. A. Proposes To Standardize Conflicting Laws of Cities and States

A feeling has spread across the country among the 3,000,000 odd automobile owners that something should be done to make the traffic laws in the different states more uniform. The necessity of this reform has been so strongly urged on public officials that the American Automobile Association has undertaken the task of harmonizing the conflicting statutes of the different states, with particular reference to city regulations.

Osborne I. Yellott, chairman of the Legislative Board, has laid out a campaign on the following lines, which will be prosecuted vigorously:

"The slow crawl of street traffic of 20 years ago has given place to the mad rush of traffic today. That traffic is daily becoming more and more fraught with danger—danger not only to the pedestrian on the streets, but as well to those who themselves form a part of such vehicular traffic. These conditions imperatively demand that those whose duty it is to do the thinking for the users of our highways, bend every effort toward a satisfactory solution of the traffic problems which have arisen with the growth of the automobile as a vehicle of commerce.

"Much thinking has already been done on this subject; the results are to be found on the statute books of our states and larger cities. But the diversity of rules adopted and in force in different sections of the country shows how far the problem is from being really solved. As chairman of the A. A. A. Legislative Board it shall be my principal task to gather from all available sources suggestions looking to the framing of a set of uniform traffic regulations, which will embody the best thought of the country on this most difficult subject, and present the same to the members of the association as a step at least in the direction of a solution of the traffic problem."

IDEAL SAFETY CODE.

Frederick H. Elliott, executive secretary of the Safety First Federation of America, has announced that a standard code of traffic regulations is being distributed among state and municipal officials who have in charge the regulation of street traffic.

The code, which is considered ideal in its construction, was formulated by the street traffic committee of the Federation, which is composed of some of the foremost experts in this country and Canada, who have been studying the subject for over 18 months. Practically all contingencies that are met with in motor traffic are covered in the findings, which cover the carrying of the license, regulation of lights, excessive smoking and use of whistles by policemen.

The proposed regulation for controlling headlight glare, which has already been incorporated in the highway laws of Massachusetts and in city ordinances in New Orleans, St. Louis, Cleveland and Indianapolis, is as follows:

Wherever there is not sufficient light within the limits of the highway location clearly to reveal all persons, vehicles or substantial objects within said limits for a distance of at least 150 feet, the headlights of all motor vehicles in motion shall give sufficient light to reveal any person, vehicle or substantial object on the road straight ahead of such motor vehicle for a distance of at least 150 feet. The headlights shall be so arranged that no portion of the beam of reflected light, when measured 75 feet or more ahead of the lamps, shall rise above 42 inches from the level surface on which the vehicle stands. Such headlights shall also give sufficient side illumination to indicate any person, vehicle or substantial object 10 feet to the side of said motor vehicle at a point 10 feet ahead of the lamps.

The term "beam of reflected light" as used in the above provision shall be construed as meaning the approximately parallel focalized rays gathered and projected by a reflector, lens or other device.

The section on speed in the code does not fix any maximum, as that is considered a point to be determined by location. This section reads as follows:

No person shall operate a motor vehicle in a reckless or careless manner, and shall have proper regard for the width, traffic and use of the thoroughfare, so as not to endanger the life or limb or the property

of any person. No vehicle shall cross any street or make any turn at a rate of speed exceeding one-half of the legal rate of speed.

It is the contention that if the movement meets with success in harmonizing traffic regulations throughout the country, the fight for sane driving and operation of automobiles will be as good as won, as it will greatly facilitate the work of educating the motorists, which is a difficult problem now owing to the great diversity in the existing laws and regulations.

AUTO FATALITIES ENORMOUS.

That over 1040 persons were killed and 8000 hurt by automobiles since the first of the present year is shown by reports from a number of the larger cities in the country. In the streets of New York City up to Sept. 1, police records show that 158 persons were killed and 4484 injured. Estimates compiled by the New York State Automobile Association show 226 killed in New York City during the same period and 192 killed in New York state outside of the city limits.

In Chicago the records for the same period show 205 killed and Philadelphia records 88 killed. Records from other cities reporting are as follows: Detroit, 63 killed, 2715 injured; Los Angeles, 57 killed; Columbus, O., 40 killed; St. Louis, 37 killed; Cleveland, 30 killed; State of Iowa, 30 killed, 400 injured; Des Moines, 15 killed; Denver, 26 killed and 524 injured; Milwaukee, 21 killed; Washington, 19 killed; San Francisco, 38 killed; Portland, Ore., eight killed; Seattle, Wash., eight killed; St. Paul and Minneapolis, seven; Dallas, five killed, 37 injured; Topeka, Kan., five killed; Kansas City, five killed.

COMING EVENTS

October.

Convention, Flint, Mich.; Fall Meeting, National Association Accessory JobbersOct. 13
Race (Speedway) Chicago.....Oct. 14
Show, Dallas, Tex.....Oct. 14-21
Show, Pittsburg, Penn.....Oct. 14-21
Demonstration (Tractors), Dallas, Tex.Oct. 14-29
Show (Closed Car Salon), OmahaOct. 15-31
Race (Speedway) Indianapolis...Oct. 19
Race (Track) Kalamazoo, Mich..Oct. 21
Tour, Commercial Car Reliability, Los Angeles, Cal.....Oct. 22-23

November.

Show, Providence, R. I.....Nov. 10-18
Race, Santa Monica, Cal., Vanderbilt Cup and Grand Prize..Nov. 16 and 18
Race (Track), Phoenix, Ariz....Nov. 18
Race (Speedway), Los Angeles..Nov. 30

December.

Celebration, National Electrical Dis-

playDec. 2-9
Race (Speedway), Los Angeles..Dec. 25
Show, Cleveland, O.....Dec. 30-Jan. 6

January.

Show, New York City.....Jan. 6-18
Convention, S. A. E., Mid-Winter Meeting at New York City.....Jan. 9-11
Show, Montreal, Que.....Jan. 13-20
Show, Chicago.....Jan. 27-Feb. 3

February.

Show, Minneapolis, Minn.....Feb. 3-10
Show, San Francisco.....Feb. 10-18
Show, St. Louis.....Feb. 18-25
Show, Omaha, Neb....Feb. 26-March 3
Show, Newark, N. J.....Feb.

March.

Show, Boston, Mass.....March 3-10
Show, Fort Dodge, Ia.....March 6-10

April.

Race (Road), Los Angeles to Salt Lake City.....April



IMPROVED TRUCK CHAIN. (Figure 235.)

A New York state truck driver recently adapted an unusual means of obtaining traction when his machine was stuck in the mud. He had tried placing stones in the soft mire, but in vain; tire chains also failed. Seeing an old fashioned split rail fence by the roadside he placed one of the rails on the ground immediately in front of the rear wheels, lashing it tightly to the wheels with ropes. When power was applied to the wheels they gripped instantly. The driver could advance only about four feet at a time before he had to change the rail and relash it in front of the wheels. By repeating this performance he was able to pull out of the soft stretch.

FORCING BUSHINGS INTO PLACE. (Figure 236.)

To properly fit bushings is often an aggravating job unless one has a power press or some other means of forcing the sleeve into place without the aid of a hammer. While it is possible to put in bushings with the aid of a hammer, there is always the risk of doing damage to the same by a blow struck one sided or in such a manner as to distort it. The safest way is to use some means that will force it in place with a powerful yet steady and even pressure. A simple little home made device for this purpose is shown herewith. The bushing is just started in place squarely as shown and a washer is placed against the inside of the piece to hold the bushing. Through this a bolt of sufficient length is placed, the nut of which bears against another washer placed against the edge of the bushing. By tightening up on this nut the bushing is forced into place evenly and accurately. One hand should hold the head of the bolt from turning while the other should be used to tighten up on the nut. When in place the nut is loosened and the bolt and washers removed.

MAKING WINDSHIELD TIGHT. (Figure 237.)

A simple means of closing the aperture existing in the type of windshield in which the upper section overlaps the lower is to set in a section of a baby carriage tire in which has been cut a V shaped groove, as shown in the sketch. The tire section should of course be as

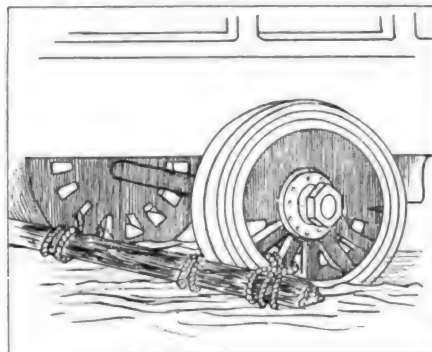


Fig. 235—An Improved Device for Pulling Truck Out of Mud Hole.

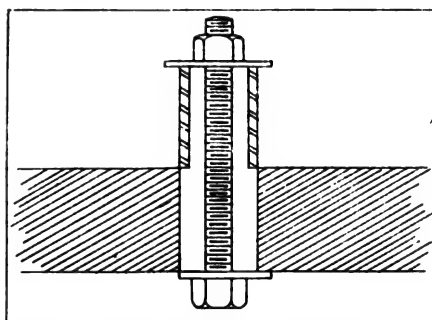


Fig. 236—A Simple but Practical Means of Forcing Bushings Home.

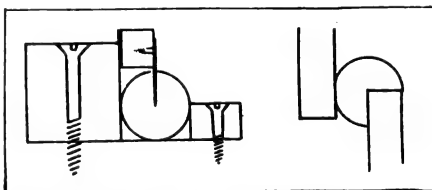


Fig. 237—Making Windshield Tight; Illustrating Home-Made Cutter.

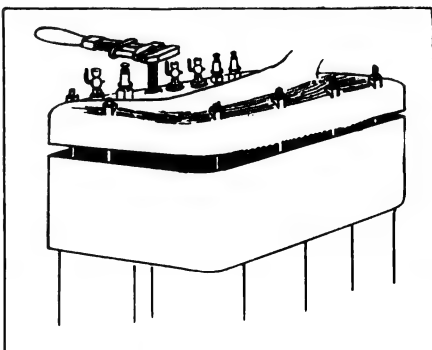


Fig. 238—An Effective Way of Removing Detachable Cylinder Head.

long as the width of the windshield aperture.

To make the groove is not very easy, unless a rigging is devised to hold the rubber section and provide a guide for the cutting tool. A simple jig may be made by nailing a strip of wood, about $2\frac{1}{2}$ inches high, to a board, and securing a second wooden strip, whose height is one-half the diameter of the tire, parallel to the first strip and at such a distance that the tire fits snugly between the two.

The cutting tool consists of a safety razor blade fastened by screws to a small block of wood. The block should be one-half as thick as the tire, and the blade project beyond it a distance equal to the depth to which it is desired to have the radial cut.

With the tire in place and the higher strip of wood acting as a guide, the cutter is drawn from one end to the other, after which tire is given a quarter turn so that the cut comes opposite the surface of the lower strip. The second cut is then made and the cross section of the tire will then show a circle with a quarter section removed.

The notched strip thus made will not only seal the aperture in the windshield and remain in place without fastening, but will stop any tendency the glass sections may have to rattle. It can be removed easily and carried under the seat when not needed.

REMOVING CYLINDER HEAD. (Figure 238.)

A simple and effective way of removing a detachable cylinder head—and one that will do little harm, is as follows: Probably in the junk pile can be found a piece of round iron stock about four or five inches long. For, say, four-fifths of its length cut a thread like that of the spark plug, leaving the remaining length as it is for use with a Stillson wrench, or it may be ground on an emery wheel to have a square head for use with an ordinary wrench. Remove the spark plug and in its place screw this new piece, which action will gradually raise the detachable part of the cylinder without in any way injuring the gasket. Sometimes it is effective to tap the piece gently with a hammer as soon as there is appreciable tension on the screw. This also makes a handy way of holding down the valve when removing the spring retainer.

MENDING A HOLE.

(Figure 239.)

A hole in a gear case, crank case or other enclosure where oil or grease is contained, may often be satisfactorily repaired by the use of a common copper and asbestos gasket, a small flat piece of iron and a bolt. To do this first drain the case and clean and smooth up the surface around the break or hole. Then find a gasket that will just a little more than cover the hole and any extending crack that might leak. Find a piece of iron about $\frac{3}{16}$ or $\frac{1}{4}$ of an inch thick of a shape that will a little more than cover the gasket, in which position centre it and drill a $\frac{3}{8}$ hole. Put a $\frac{3}{8}$ bolt in this piece of iron and lay it on the gasket against the inside of the case. With suitable washers placed on outside of the case, screw the nut of the bolt up tight and the leak will be a leak no more. Some times it is necessary to put a gasket between the head of the bolt and the iron piece, but this depends a great deal upon what the case contains. Should it happen that the break comes at a curved portion of the case the same procedure may be followed, except that the iron piece probably would have to be fitted to conform to the interior shape of the case at point of break. In either case the gasket will take care of itself and perform its proper function. This makes a simple and reliable repair and much quicker and cheaper than taking the case down and out of the car for welding. If there is reason why the head of the bolt cannot project inside the case a flat headed bolt or stove bolt may be used, countersinking the head into the iron piece to a nice tight fit.

REFITTING VALVE CAPS.

As a general rule it will be found that valve caps when cold will be covered with carbon and a gummy oil and as a result screw into place very sluggishly when being refitted. To remedy this it is often advantageous to lubricate the threads with a little paraffin. By so doing the caps can often be screwed into place down on the copper and asbestos washers with the fingers, requiring merely a final tightening with the wrench. It is always advisable to do this thoroughly, especially with the intake valve caps, not only as a guard against compression leaks, but to prevent the cap unscrewing instead of the spark plug when removing the latter.

CUTTING METAL TUBING.

(Figure 240.)

Anyone who has tried it knows that it is not an easy matter to cut tubing sharply and square. To make a cut at a certain angle is even more trying. A simple and easy way to do this is to drill a hole through a block of wood having square edges, of such size as to just fit the tubing to be cut. Mark out on the block a line making the desired angle with the tubing and with a hack saw cut on this line. This will make a sharp cut and give accurately the angle desired.

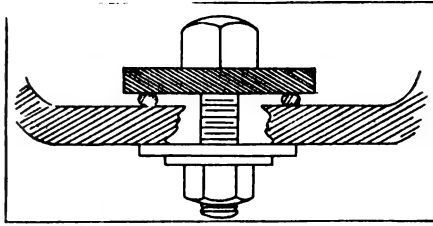


Fig. 239—Mending a Hole with Iron Disc, Gasket and Bolt.

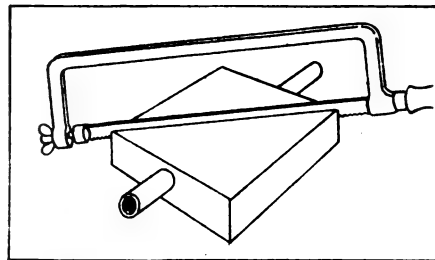


Fig. 240—Home-Made Mitre Box for Cutting Metal Tubing.

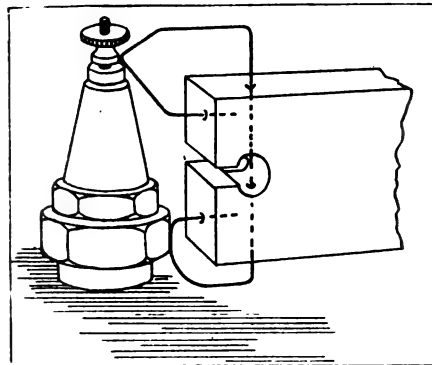


Fig. 241—How to Make an Effective Spark Plug Tester.

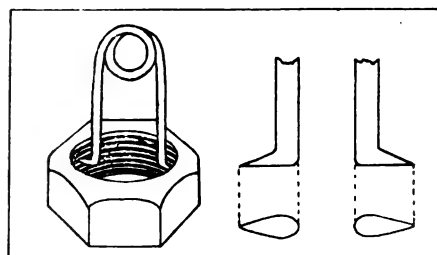


Fig. 242—Simple Device for Cleaning Threads of Nuts of Foreign Matter.

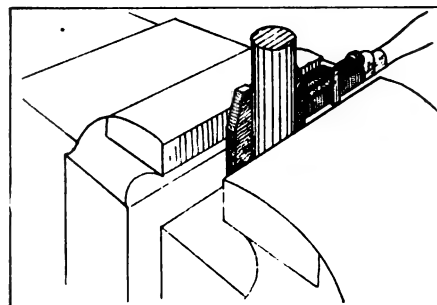


Fig. 243—A Practical Suggestion for Holding Round Stock.

SPARK PLUG TESTER.

(Figure 241.)

A device for testing spark plugs without removing them from the cylinder, or disconnecting the terminal wires, may be easily made from a piece of hard fiber or wood and some copper wire. Hard fiber is to be preferred. Bore a $\frac{1}{4}$ inch hole in a piece about three inches long and $1\frac{1}{2}$ inches wide and $\frac{1}{4}$ inch thick at a point near one end and in the centre of the wide face. Cut a slot as shown in the cut. At right angles to the narrow face drill a hole, passing through the centre of the half inch hole, of a size to take a number 12 or 14 copper wire. Place the wire through this hole as shown, leaving an opening in the aperture, between the wire ends, of about half the thickness of a new dime. Bend the other ends of the wire as shown or to suit and insert in holes drilled in the end face of the block. By placing this device against the plug top terminal and the base or ground the spark will be seen in the opening. As a means of short circuiting a cylinder this device is handy, too, by connecting with a clip the gap in the opening and using as before.

THREAD CLEANER.

(Figure 242.)

Herewith is a simple device that will be found handy in cleaning out the thread grooves in nuts that are so clogged with grease, grit or otherwise filled up that it is hard to turn on its proper bolt is here shown. It is merely a substantial piece of reasonably hard wire coiled so as to have an appreciable spring in the direction of the points which are made by grinding on the emery wheel or cutting with a file in such a manner as to fit snugly and correctly in shape into the thread grooves of the nut.

HOLDING ROUND STOCK.

(Figure 243.)

Holding a piece of round stock in a vise, especially when jerky or strenuous work is to be done upon it, is a thing that is always troublesome. To hold such a piece effectively some sort of sharp edged jaws are often used. A homely means of accomplishing this end is to use the jaws of a good sized monkey wrench. They are opened up enough so the round stock will fit into the space between them, but not quite as far in as the shank. The wrench is set in place against one of the jaws of the vise (preferable the one farthest from the operator) and the round piece to be worked laid against the jaws as shown in the illustration. The other jaw of the vise is now screwed up firmly against the round stock and it will be found to hold securely against the most vigorous shocks. If the piece is of a finish easily marked a piece of soft sheet brass should be placed against it at the points of contact.

Do not overprime the motor. Gasoline does not vaporize readily at low temperatures. If in trouble from this cause, open the compression reliefs in order to clear the cylinders.

SUGGESTIONS FOR THE FORD CAR OWNER.

Restoration of the Front Axle Unit and the Lubrication of the Springs to Insure Easy Riding—The Steering Column and the Probable Conditions from Wear.

The 67th article dealing with the operation, construction, maintenance, care and repair of the model T Ford chassis is the 18th of the series devoted to adjusting, restoration and overhauling.

WHEN overhauling the front axle unit there is reason to expect more or less wear wherever moving parts contact. There are means for lubrication for some of these parts, such as



The Steering Wheel Removed from the Internal Gear Case to Show Details of Construction.

the wheels, the spindle body pivots, the spindle arm eyes, the spring perches and the spring eyes, either by packing with grease or by oiling, but the ball and socket joints of the drag link and the rear end of the radius rod can be oiled only. There is more or less use for these joints all the time the machine is being driven and because of the accumulation of abrasives and the difficulty of keeping some of them clean, there will be wear that will be progressive and must be compensated to minimize rattle and take up lost motion. The description and illustrations of the previous installments show the various parts and their relations and how they are secured, and obviously when all of the components have been assembled they should be perfectly tight and without play, and yet they should function without strain or stress.

The wheels should always be balanced on the spindles and there should be no play in them. The condition of the bearings can always be determined by jacking the axles and raising the wheels, and in the event of motion this can be compensated by removing the caps and adjusting the cones. The more frequently the wheels are packed with lubricant the better will be the con-

dition of the bearings, and too great care cannot be taken. The tie rod can be adjusted as often as is necessary by taking out the bolt at the left end of the rod, slacking the clamping bolt, turning the yoke, tightening the clamping bolt and replacing the bolt through the spindle arm.

Renewal of the Bushings.

One need hardly be advised that in the event of there being wear of the bushings these should be replaced by new, and should the bolts or the spindles of the spring hangers be worn these should be renewed. The ball and socket joints can be taken up by draw filing the cases of the caps so that the diameters of the sockets will be reduced, care being taken to have the fit of the sockets on the balls not too tight, and yet close enough so there will be no movement. If one wishes to do so a great deal of wear can be prevented and noise eliminated by protecting the ball and sockets by leather or heavy cloth boots that can be packed with grease. These are practical for the ends of the drag link, and with boots comparatively little attention is necessary.

While there is no doubt that the steering gear linkage is exposed to road dust, mud and water at all times and cleaning is necessary very frequently, the saving that will result from keeping the parts as free as possible from road accumulations will well repay one for the time and labor



The Three Bands of the Transmission Gearset Relined and Ready for Replacement.

required to wipe them. The condition of the springs should not be neglected by the owner. Much of the comfort and pleasure of the passen-

gers depends upon the functioning of the springs, and these should be as free for action as is practical. The Ford chassis frame is suspended at the ends on transverse springs and these springs are directly above the axle, so that there ought to be minimized end throw when the wheels contact with road obstructions. If the springs are in good condition the suspension may be said to be far better than were any part of them forward of the axles, because there should be comparatively slow deflexion and reflexion.

Spring Design Unconventional.

The design of the Ford chassis so far as the use of the springs is concerned differs from any other built. Because the springs are installed transversely they are not intended to drive the wheels in the manner that is conventional with automobile design, for the radius rods are expected to sustain practically all the stresses of tractive effort. The springs will yield very readily at either end in the event that a wheel passes

more action unless there is a load in it, but this will be more generally absorbed if the springs are well cared for so that they will have as much resiliency as is possible. This can be insured by lubrication of the hangers or shackles and the spring leaves. The springs, when they are assembled at the plant of the manufacturer, are lubricated so that there will be minimum friction from contact of the leaves, but if this lubricant is not renewed from time to time the action will become stiffer from the increased friction due to rust and dust that might be accumulated between them. One hardly need be impressed with the fact that water from storm or washing will penetrate between the leaves and rust will result unless there is protection in the form of lubricant.

Comparatively little attention is given to spring lubrication, even the hangers being neglected. The springs, if partly or wholly bound with rust, lose resiliency materially and there can be no restoration unless the cause is removed.

Near the ends of the springs are clips that retain the ends of the leaves and prevent them separating, but do not restrain them moving when they are deflected or reflected. So long as the weight of the body is upon the springs they are slightly compressed. If a piece of plank be placed under and across the frame directly in front of the rear axle and a jack and blocking set under the plank the body can be lifted so that the axle will be clear of the ground or floor. The spring leaves will then be separated so that a thin oil can be injected between them, or better still, graphite can be blown between the leaves with a dust or powder

gun and then oil applied. But a small volume is required to lubricate the leaves. When this has been done the spring can be cleaned with a cloth wet with gasoline.

No Need of Disassembling the Springs.

The forward end of the body can be lifted by placing a box or blocking directly ahead of the front axle and using a length of plank as a lever, which will prevent strain upon the engine case, and while this is held or balanced by a weight, the front spring can be lubricated in a similar manner. There is very seldom need of disassembling the springs, and no good purpose would be served by doing this. There is need of examining the spring hangers and the bushings of the spring perches to determine the degree of wear, and in the event of hanger bolts or the bushing being worn these should be replaced. While work is being done on the chassis the frame should be inspected to learn that the rivets are



Cover of the Transmission Gearset Case with the Brake Band on the Shaft to Show the Manner of Installing and Operating.

over an obstruction on the surface, and this means that only half of a spring may absorb a shock, instead of a full spring as would be the case were they located longitudinally, and there cannot be the same degree of action that would result from a longitudinal spring.

Because there is comparatively slight arc of the front spring the action is minimized and there is provision for considerable movement of the hangers or shackles that should take up or absorb road shock without transmitting it to the frame. The same condition of hanger action obtains in greater degree to the rear spring, which is suspended between perches that are carried on the brake flanges or spiders, although there is a more pronounced arc of the spring and there is a supplementary central arc to afford clearance for the rear axle housing.

Insurance of Spring Resiliency.

As the body is light there will necessarily be

secure, for if any are found to be loose these should be tightened by peining the ends with a hammer and a substantial block of metal held against the heads. If the rivets are worn these should be removed and replaced by new.

The springs are secured to the frame by pairs of clips that retain the spring centres in the channels of the cross sections, the nuts being locked. Between the springs and the frame members are leather pads that are intended to prevent noise from the movement of the springs against the metal. There need be no attention given the spring clips other than to see that the nuts are tight and that there is no possibility of movement of the springs.

Steering Column Construction.

The steering column has been described previously so carefully that its construction ought to be known to the reader, but briefly it consists of a tube that encloses a heavy rod and carries brackets in which are mounted the rods that are linked with the carburetor and the timer and by which the supply of fuel to the engine and the position of the ignition spark are controlled. The tube may be best designated as the column and the rod as the post in whatever review may be made of them. The column does not extend to the end of the rod, but at the base, which is about midway the length, is a flange that is designed to be bolted to the floor of the driver's compartment, this being large enough to give the column substantial rigidity.

The rod, however, is carried beyond this flange and at the outer end is a bracket that is formed so that it may be bolted to the frame of the chassis, this affording a solid support. The bracket also carries the ends of the carburetor and timer control rods. The bracket is of good size and strongly made, for there are heavy stresses upon the steering post because of the shocks from road obstructions. The bracket is held by three bolts and is seated on the frame close to the end of the left side member. The steering post at the upper end has a flange that is triangular in general form, on the points of the flange are three studs or stub shafts that carry small pinions, which are free to turn. On the upper end of the column is fitted a case that has an internal gear cut in the periphery that is known as the internal gear case. In the centre of this case is a bore in which the steering post is carried. In the centre of the steering post with reference to the pinions is a shallow bore, that is bushed. Into this bore is placed a short shaft on which is securely keyed a pinion that meshes

with the three pinions that are carried on the stubs on the triangular flange.

Operation of the Steering Gear.

The gears are covered by a cap that is screwed on to the internal gear case. The hand wheel is secured to this short shaft by a nut. Turning the hand wheel from left to right will turn the pinion on the stub shaft in the same direction, and the three pinions between it and the stationary internal ring gear will turn from right to left. On the end of the steering post is a short curved arm that has a ball or globe at the outer end. This arm is keyed to the post. Continuing the illustration, turning the hand wheel will swing the arm on the end of the steering post from right to left and the drag link will draw the tie rod in the same direction and the wheels will be at an angle so that the chassis will move toward the right.

The steering post bracket bore is bushed so that it may be renewed in the event of wear and



The Transmission Gearset Cover Replaced and the Bands Being Adjusted with an "8" Wrench, Testing the Clearance by Pedal Movements.

there is a large grease cup to lubricate the bearing of the post. The internal gear case is packed with grease, and as it is securely protected but very little attention is necessary.

(To Be Continued.)

"THE FIRESTONE."

The Firestone for October, the monthly publication of the Firestone Tire and Rubber Company of Akron, O., is the largest and most interesting number since it took its place among the regularly issued list of manufacturers' publications.

A feature of the issue is the illustrated account of the annual outing of the Firestone superintendents and foremen. The various activities that marked the event with individual pictures are graphically illustrated.

Reorganization of General Motors

Name of Company May Be Changed to Include "Corporation" and Capital Increased.

A plan has been announced for the reorganization of the General Motors Company through which that concern will become the General Motors Corporation, with a capital of \$100,000,000. The plan has been consented to by more than 65 per cent. of the stockholders of the General Motors Company.

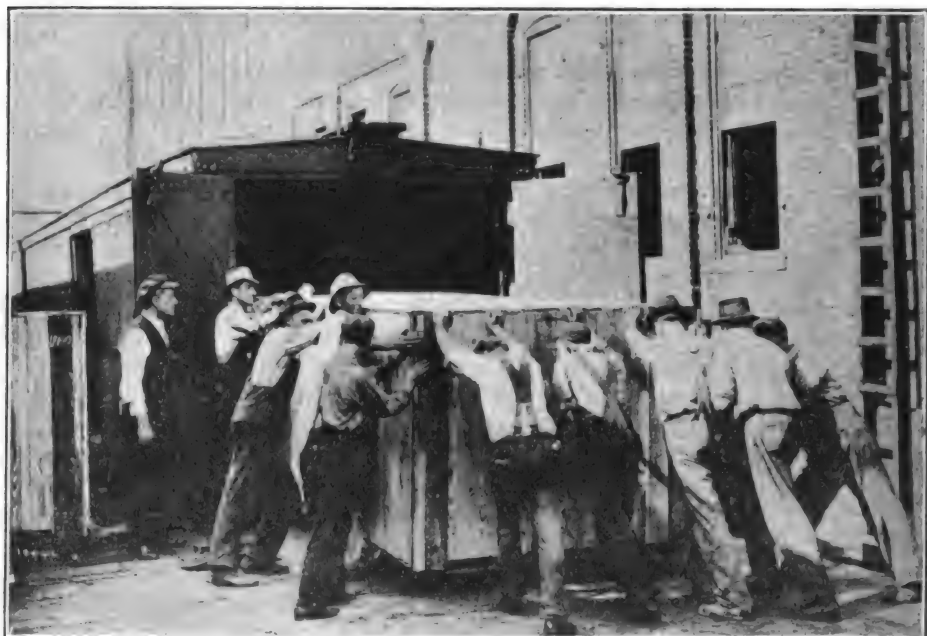
The new company, which is to be incorporated under Delaware laws, will not change materially, it is understood, the present system of operating the subsidiary companies. The capitalization will consist of 1,000,000 shares of a par value of \$100 each. Of the total amount 200,000 shares will be six per cent. cumulative, non-voting, preferred stock, which will be redeemable at the option of the company at \$110, plus accrued dividends on and after Sept. 18, 1918.

The merging of the old company into the new will be effected through the exchange of stock. Stock of the old company deposited with the Guaranty Trust Company of New York on and after Oct. 18, and not later than Dec. 15, will be exchanged on the following basis: For each share of present preferred stock, one and one-third shares of the new preferred; for each share of the present common, five shares of the new common.

The annual statement of the General Motors Company, as of July 1st, showed earnings of \$27,740,596, or 168 per cent. on the common stock after deducting the preferred dividend charges. In 1915 the net profit was \$14,926,322. Notes of \$2,328,000 were paid off out of the surplus, \$1,048,964 for preferred dividend, \$10,730,150 for common dividend and \$3,726,752 for plant additions, leaving an increase in cash on hand and in banks of \$7,950,451, as compared with the year ending in 1915.

During the fiscal year ending July 1st the total sales aggregated \$156,900,296, a gain of \$62,475,455 over the previous year's business.

The General Motors Company controls through the ownership of all the stock the following companies: Buick, Cadillac, Oakland, Olds, Northway, Champion Ignition, Jackson, Church & Wilcox, Westcott-Mott and General Motors Truck. It also owns \$500,000 of the \$1,003,000 outstanding common stock of



Loading a Shipment of 47 Pathfinder Twelve-Cylinder Cars for Petrograd, Russia, to Be Sold in That Country.

the McLaughlin Motor Car Company.

The officers of the General Motors Company, headed by President W. C. Durant, are as follows: Vice president, A. G. Bishop; secretary, Standish Backus; treasurer, James T. Shaw; comptroller, W. H. Alford. The board of directors, of which Pierre S. DuPont is chairman, is composed of F. L. Belin, H. E. Bishop, W. P. Chrysler, R. H. Collins, W. L. Day, W. C. Durant, J. A. Haskell, L. G. Kaufman, W. C. Leland, J. H. McClement, C. S. Mott, J. J. Raskob, C. H. Savin, F. W. Warner, A. H. Wiggin.

When the new \$100,000,000 General Motors Company starts officially under its new financial plan, Nov. 1, it will be free of funded debt and will have over \$25,000,000 cash working capital. It is expected that the sales of the company for the present year will exceed \$200,000,000 as compared with \$156,000,000 during the year just closed.

ARGO PLANT SOLD.

The Columbia Motors Company of Detroit, Mich., has purchased the Argo Electric Vehicle Company of Saginaw, Mich., and will soon begin the manufacture of a new car.

The Columbia Motors Company has a capital of \$500,000. The officers are J. G. Bayerline, president and general manager; A. T. O'Connor, secretary and

treasurer; T. A. Bollinger, vice president; Walter L. Dalley, sales manager; Ray Long, chief engineer; W. E. Metzger, vice president; John Mohrhardt, superintendent. These officials constitute the board of directors.

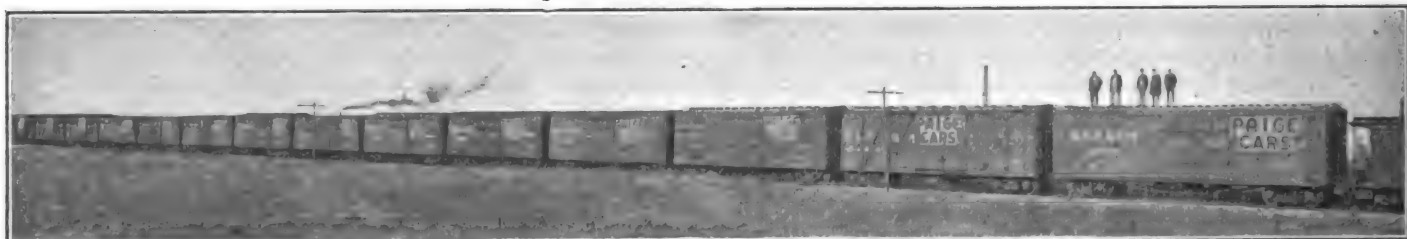
A production of 3500 cars for the coming year is scheduled by the company. The cars will sell in the neighborhood of \$1000 each.

WARNER HEADS OAKLAND.

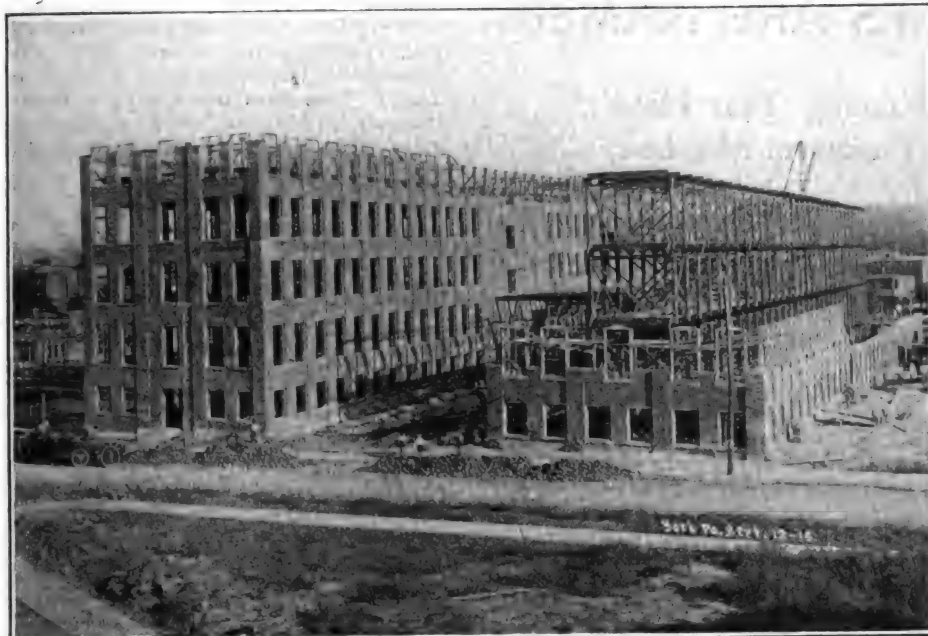
At a recent meeting of the directors of the Oakland Motor Car Company of Pontiac, Mich., F. W. Warner was elected president to fill the vacancy created by the recent resignation of C. W. Nash. At the same time C. B. Voorhis was elected vice president and both he and Mr. Warner were elected to the directorate.

NEW DEPARTURE EXPANSION.

The New Departure Manufacturing Company, Bristol, Conn., has underway a number of additions to its plant which when completed will double the capacity of production. At present the capacity is 21,000 bearings a day, which is 100 per cent. over what it was at this time last year, and 2700 men are employed. Present plans call for an increase in the working force to 4500 men by July 1,



Paige Cars Are Being Shipped in Car Load Lots, This Shipment Being Routed for Milwaukee, Wis. Sales for August Were More Than \$2,000,000.



The American Chain Company, Maker of Weed Chains, Is Building Extensive Additions to Its Plant at York, Penn.

1917, and a daily capacity of 30,000 to 35,000 bearings. Work is now progressing on a new four-story factory, 60x450 feet, and work will soon commence on another building, 100x600 feet, part of which will be one story in height and part three stories.

The 2700 employees of the company were recently the guests of the concern at a mammoth barbecue.

REO PRODUCTION.

Reo production for the 1916 fiscal year, including pleasure cars and trucks, totaled 26,304. Of this number the Reo Motor Car Company delivered 23,753 passenger cars and the Reo Motor Truck Company 2551 trucks. The total sales of both organizations for the year were \$27,884,000, of which amount the pleasure car company made \$24,363,000 and the truck company \$3,521,000. Both concerns report an increase in sales for the year of over 33 1/4 per cent.

INCREASE FISK STOCK.

At a meeting of the stockholders of the Fisk Rubber Company, held at Chicopee Falls, Mass., the capital stock of the company was increased to \$24,500,000. The new capitalization will consist of \$7,500,000 first preferred convertible

stock, of which \$5,000,000 will be issued at once; \$5,000,000 second preferred, of which \$2,500,000 will be issued. The balance of \$12,000,000, which is common stock, will be retained as treasury stock.

A syndicate headed by Easterbrook & Co. of Boston have underwritten the first preferred and the second preferred is being subscribed for by the stockholders on a basis of one share for every four shares of common and second preferred owned in the aggregate. The increased capital is to provide for expansion in manufacturing facilities.

REO CONSOLIDATION CONFIRMED.

The consolidation of the Reo Motor Truck Company and the Reo Motor Car Company on a basis providing for the exchange of one share of stock of one company for one of the other has been confirmed by the stockholders of both companies.

E. C. MORSE WITH CHALMERS.

E. C. Morse, who recently resigned as sales manager of the Hudson Motor Car Company of Detroit, has been elected vice president of the selling division of the Chalmers Motor Company and will have charge of the sales service and advertising.

Reorganizing International Co.

Big and Important Financial Deal Has Been Carried Out—New Capitalization Basis.

A plan for the reorganization of the International Motor Company, involving the raising of \$1,500,000 additional cash and the wiping out of \$2,881,000 indebtedness in the form of notes, has been perfected through the organization of a new company which will take over the old concern. The plans were carried out by a committee headed by Henry K. Pomeroy, former president of the New York Stock Exchange, and his efforts have received high commendation, as the notes owed by the company, with accrued interest, totaled nearly \$3,000,000, and are all due on Nov. 1.

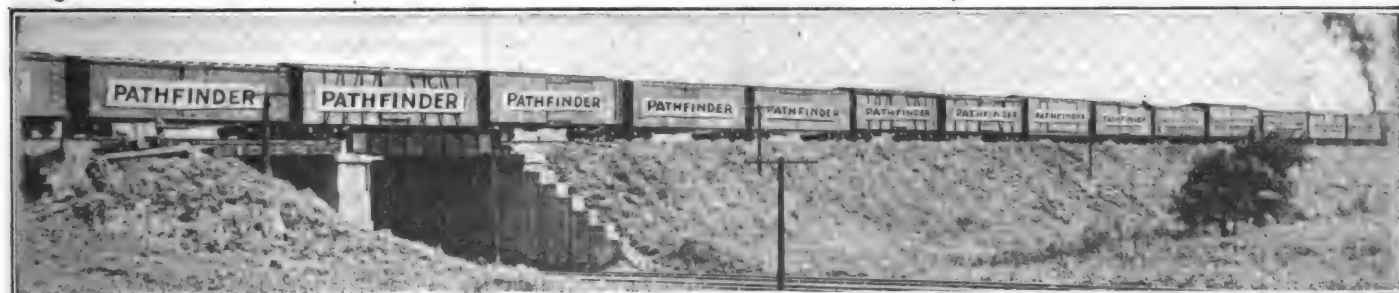
The new company will have the same name as the old, but will be capitalized on a different basis. An issue of \$4,381,000 seven per cent. first preferred cumulative stock will be made to meet the notes and provide cash working capital, while there will also be an issue of \$2,723,000 second preferred stock and an issue of 53,638 shares of common stock. Holders of the present \$3,600,000 preferred will receive 60 per cent. in the new second preferred and 10 per cent. in common. For the outstanding \$5,628,125 common stock the holders will receive 10 per cent. in second preferred and 10 per cent. in common of the new company.

The International Motor Company owns all of the stock of the Mack Brothers Motor Car, the Sauer Motor and the Hewitt Motor companies. Vernon Munroe is president and Ambrose I. Monnell, president of the International Nickel Company, is chairman of the board of directors.

Earnings for the past year were \$661,000 net, but owing to the big deficit that the company was carrying there was a deficit at the end of the year of \$2,457,000.

WINTON STOCK OFFERED.

In the near future an offering of \$1,500,000 seven per cent. cumulative preferred stock of the Winton Company of Cleveland, O., will be made through Borton & Borton, bankers and brokers.



The Pathfinder Company Is Doing a Large Foreign Business, as Is Evidenced by This Train Load Shipment Destined for the Russian Empire.

N. A. C. C. COMMITTEES ARE NAMED.

Important Positions for Ensuing Year Have Been Distributed Among Prominent Members.

President Charles Clifton of the National Automobile Chamber of Commerce has completed the make-up of the committees that will take up the active work of the organization for the ensuing year.

The personnel of the committees is as follows: Patents: C. C. Hanch, Studebaker, chairman; William H. VanDervoort, Moline; Winsor T. White, White; Wilfred C. Leland, Cadillac; Howard E. Coffin, Hudson.

Traffic: William E. Metzger, Argo electric, chairman; R. E. Olds, Reo; A. I. Philp, Dodge.

Show: George Pope, chairman; Wilfred C. Leland, Cadillac.

Legislative: H. H. Rice, Waverly, chairman; J. Walter Drake, Hupp; J. I. Farley, Auburn.

Electric Vehicle: H. H. Rice, Waverly, chairman; Fred R. White, Baker R. & L.; W. C. Anderson, Anderson.

Commercial Vehicle: Winsor T. White, White, chairman; Alvan Macaulay, Packard; H. Kerr Thomas, Pierce-Arrow; P. D. Wagoner, General Vehicle; M. L. Pulcher, Federal.

Good Roads: Roy D. Chapin, Hudson, chairman; William E. Metzger, Argo electric; C. C. Hanch, Studebaker.

Hand Book: Carl H. Pelton, Maxwell, chairman; A. I. Philp, Dodge; A. L.

Riker, Locomobile.

Membership: Wilfred C. Leland, Cadillac, chairman; Hugh Chalmers, Chalmers; C. W. Churchill, Winton.

BIG HARROUN CONTRACT.

A contract between the Harroun Motors Corporation and Speyer, Cole & Co., in association with Graham & Co. of London, and Norton, Lilly & Co. of New York, involves the exportation of 2000 Harroun cars during a period of five years.

The contract, which amounts to about \$5,000,000, provides for the exclusive dealing in Harroun cars in England and the colonies, except Canada, for a period of eight years.

PROVIDENCE SHOW IN NOVEMBER.

The Providence Automobile Show, which is held in the State Armory in that city annually under the auspices of the Rhode Island Licensed Automobile Dealers' Association, will be held during November from the 10th to 18th inclusive. The plan of opening on a Friday evening, giving two full Saturdays for out of town visitors and business men, proved so successful last year that it has been

adopted permanently.

Percival S. Clark, who has managed the exhibitions for several years and made them highly successful, is again in charge. This show has always attracted widespread attention, as it is the first of the large events of the season in the big cities.

INCREASE CAPITAL.

The Marathon Tire and Rubber Company of Cuyahoga Falls, O., will increase its capital stock from \$500,000 to \$1,000,000, to provide increased manufacturing facilities. The sales of the company's products are now running 70 per cent. ahead of those at this time last year.

MASTER CALORITE PLUGS.

A number of improvements have been made in the 1917 Master Calorite spark plugs, which are manufactured by the Hartford Machine Screw Company of Hartford, Conn. The size of the insulator has been greatly increased to give it strength to withstand side blows or knocks from the slipping of a wrench or other tool. The insulators in Master Calorite plugs, which were always extra large, have withstood the most severe tests, such as being heated white hot in a gasoline blow torch and then plunged in cold water. This test has been repeated many times without the plug showing any signs of a fracture or cracking.

PHOTOGRAPHIC CONTEST.

The Portland Cement Association, with headquarters at 111 West Washington street, Chicago, is conducting a photographic competition for which a number of cash prizes will be given for the best pictures received and in addition fair prices will be paid for all pictures suitable for reproduction in advertising booklets or illustrations. Details of the competition will be sent upon request to the above address.

AN "ELECTRIC FORD."

The latest Ford rumor, which emanates from Seattle, Wash., is to the effect that Mr. Ford is planning an electric car to be sold at a moderate price. In connection with the rumor, it is stated that he was prompted in his new enterprise by the high prices prevailing for gasoline.

The first of these new cars, which will generate their own electricity, according to the story, will make its appearance around Christmas time.

ADOPTS RAYFIELDS.

Rayfield carburetors have been made standard in the equipment of the Lexington-Howard cars. This instrument has established a reputation in carburetion which calls for excess power, developed from low-grade gasoline, plus economy in consumption of fuel.

PRELIMINARY STATEMENT ON THE MANUFACTURE OF AUTOMOBILES, AND AUTOMOBILE BODIES AND PARTS.

Comparative Summary: 1909 and 1914.

	Census			1909	Per Cent. of Increase, 1909-1914
	Automobiles	Automobile bodies and parts	Total		
Number of establishments*	300	971	1,271	743	71.1
Persons engaged in manufacture	91,997	53,954	145,951	85,359	71.0
Proprietors and firm members	60	700	760	405	87.7
Salaried employees	12,630	5,469	18,099	9,233	96.0
Wage earners (average number)	79,307	47,785	127,092	75,721	67.8
Primary horsepower	104,983	68,701	173,684	75,550	129.9
Capital	\$312,876,000	\$94,854,000	\$407,730,000	\$173,837,000	134.5
Services	84,901,000	54,552,000	139,453,000	58,173,000	139.7
Salaries	17,966,000	19,560,000	37,526,000	9,479,000	295.9
Wages	66,935,000	34,992,000	101,927,000	48,694,000	109.3
Materials	292,598,000	63,610,000	356,208,000	131,646,000	170.6
Value of products	503,230,000	129,601,000	632,831,000	249,202,000	153.9
Value added by manufacture (value of products less cost of materials)	210,632,000	65,991,000	276,623,000	117,556,000	135.3

*In addition, in 1914, 83 establishments primarily engaged in other lines of manufacture, produced automobiles to the value of \$6,636,920, and 434 establishments of this character manufactured automobile bodies and parts to the value of \$10,515,476; in 1909, similar establishments produced automobiles valued at \$830,080 and automobile bodies and parts valued at \$4,415,266.

The Growth of the Automobile Industry as Shown by the United States Government Census.

MOTOR STARTING AND CAR LIGHTING.

Characteristics of Design and Construction of Different Types of Generators and Motors Found in Conventional Systems—Some Features of Winding.

THE reader has been informed that a generator and a motor do not differ materially in general characteristics of construction and that a motor may be used as a generator and a generator as a motor with but comparatively little change, the principal difference being in the location of the brushes. There are several types of construction, so far as the armatures are concerned, and generally speaking these may be either the ring or the drum type. The drum type, however, is that most commonly used and this is built with a solid core in which are longitudinal channels in which the windings are laid.

The ring type armature consists of a shaft on which is mounted a spider or frame, which, for the purpose of description, may be likened to a wheel in that it has a hub in which a shaft is fixed, from which radiate arms that carry a rim, and the windings are longitudinally placed across the face of the rim and through the spaces between the hub, the arms and the rim. The windings in this instance are wholly or partly retained on the armature by the rim, although there may be binding bands that encircle the armature circumferentially. This construction is usually used for large machines and the air space within the windings is desirable, if not necessary, for the circulation of air has a cooling influence that will materially reduce the temperature of the armature in the event of overload or some other condition that may cause heating.

Small Machines Are Enclosed Types.

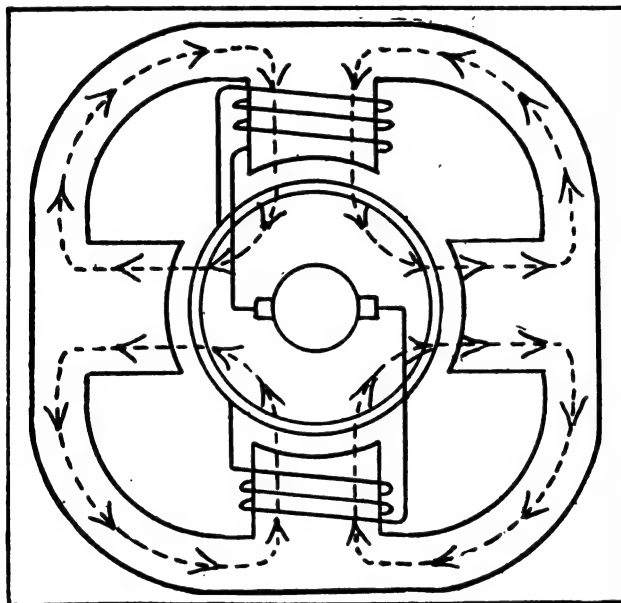
With this type of armature (the machine may be utilized for stationary power) ventilation is often a cogent factor of design, but with machines such as are used for starting and lighting systems, which must be enclosed to protect them from the dust, water and lubricant, ventilation is not considered and other means are resorted to to maintain the temperature below what may be regarded as a critical point. The design is very carefully developed, for by variance of details differing effects can be obtained, and of course endurance is one of the objects that is given great attention.

The construction of the machines with reference to the work they must do is the basis of design. By this is meant that a generator for a two-unit system must be driven constantly and usually much faster than the motor that is used with the same system, which is used intermittently. The generator would necessarily be designed to afford this degree of constant work without heating. The motor would have to ab-

sorb a very large amperage to yield the power necessary for turning the engine, but it would not be worked for more than a brief period at any one time and there would not be much probability of the armature heating because the work, while heavy, would be such that the temperature would not rise to degree that would be dangerous.

Construction of the Armatures.

With rare exceptions the armatures for both generators and motors are built with a sleeve as the basis, on which is constructed the core of soft iron laminae. The laminations are extremely thin and are cut by punching the bore for the sleeve and the notches that form the channels or grooves for the windings. These sheets or discs



The Flow of the Currents of Magnetism Through the Fields and Armature of a Typical Four-Pole Machine.

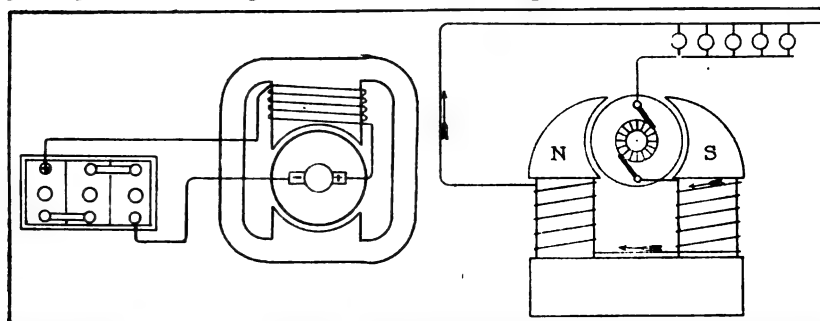
are usually coated on both sides with a lacquer or varnish that is an insulation, but with some makers of the cheaper machines the rust or oxidation of the sheets is made to serve as an insulation, and it answers the purpose admirably, though it is not as good a protection against moisture. When these discs are assembled they are placed on the sleeve, which is splined, or it may be made with a key running the full length. There is a heavy plate or collar at either end of the sleeve and the discs are forced solidly against each other and one of the collars by heavy pressure, after which the remaining collar is forced on and locked, often with a locking nut and sometimes by one of several forms of keys.

This description sounds very simple and one might be inclined to ask what are the elements

of design that call for engineering skill, and the best answer that can be made is that of proportioning. For instance, there is the length of the armature, the diameter, the width and depth of the grooves or channels, the positions of the channels, which may parallel the axis of the armature or have some degree of angularity with reference to it, and these factors all have relation to each other. That is, the diameter will depend upon the length, the width of the channels will depend upon the number, the depth will be governed by the size of the wire to be used, the number of the channels will govern the "eddy currents" which cause heating, the degree of angularity will also have influence upon noise made while in operation, and the winding will depend upon the form of the commutator. By form of commutator is meant that this will consist of as many copper segments as is practical to use to obtain a desired result. The greater the number of segments in the commutator the better will be the operation of the machine.

Number of Armature Channels.

The number of channels in the armature is perhaps one of the greatest factors of design, for



Diagrams Illustrating a Series Wound Generator Field Winding and Connections, That at the Left for Charging a Battery and That at the Right for a Lighting Circuit.

the danger of eddy currents decreases with the increase of the number of channels. The production of eddy currents may cause other complications in addition to heating, and there is desire that the danger be minimized so far as possible. Statement should be made that the use of the sheets of soft iron for the core is that there shall be as great a degree of magnetic permeability as is possible, for it is necessary that there be the lowest resistance of the armature to insure the use of minimum current when doing a given work.

The windings of the armature are laid into the channels of the core. The wire is usually a high grade of copper, generally square, that is wound with cotton fabric to insulate it. Because the efficiency of the machine is dependent upon the character of the windings much care is taken in this work to see that the insulation is perfect. These windings are connected with the commutator by soldering. Commutators vary in design, but the construction is practically the same. The commutator as it is generally built consists of a series of pieces of copper that are L shaped, with

the longest arm placed longitudinally, or parallel with the armature shaft, and the shorter arm is connected with the insulating disc at the end of the armature drum.

The Construction of the Commutator.

The back or lower part of the L that is placed parallel with the shaft is so formed that it is keyed or locked into the ring of insulating material that is the core of the commutator. The copper segments are carefully spaced equi-distant with a narrow segment of insulation between each. The commutator as it is completed consists of the segments (which from the end resemble keystones slightly), each exactly the same size and same distance apart, with the segments of insulation uniform in thickness between them, which may be likened to a wheel without a rim, the spokes being the insulation. The insulation is to within 1/32-inch of the surface of the commutator.

The coil of the winding is shaped on a former and it consists of a piece of wire wound with fabric that is looped around the commutator end of the core with the ends laid in two of the channels. These ends similarly loop at the pinion end

of the commutator and are carried back through the same grooves in which the wires were originally laid, and the ends connected to two different copper segments. From this one should understand that the winding is two layers of wire, one above the other, in each channel, with two layers from channel to channel at the pinion end of the armature and but one section between the channels at the

commutator, each coil having two commutator segments. That is, each piece of copper is a point for connection between two sections of the armature winding.

Collection of the Currents.

This construction makes possible the collection of the currents induced in the winding at predetermined points. As has been pointed out, while the result from the magnetic induction of the armature windings is the production of an alternating current, there are points at which the induced current will always move in the same direction, a condition due to the permanency of the magnetic influence at these points. These points are defined as the points of commutation or neutral points, and the points are the location for the brushes which form the terminals of the outside circuit, that the current sent over the circuit may be perfectly constant. As the armature rotates the brushes bear on the conducting segments of the commutator at the exact neutral point, which neutral lines are at either extreme of the determined diameter of commutation, and in theory, at least, the diameter is at right an-

gles to the magnetic lines of force, as estimated for a two-pole magnet.

The angle, however, is slightly varied by the magnetic lag. As stated, there is excellent reason to have the number of channels carrying the sections of armature winding as numerous as is practical, and the series of segments of the commutator is governed as to number by the character of the winding. The greater the number of collecting members in the commutator the less the fluctuation of the current and the less the probability of arcing or sparking, but the segments must not be so numerous that brushes of sufficient diameter to carry the current will overlap and burn the armature. From the viewpoint of the designer the size of the commutator is as important as the number of segments of copper included in it.

How the Windings Are Insulated.

After the armature has been wound and the commutator connections made the winding is impregnated with an insulating compound. It is then baked to dry the insulation thoroughly and harden it, for it must be resistive of moisture or lubricant. Much care is taken to make the surface of the commutator true, which is done by turning, and when finished the armature must balance perfectly. Weight is taken from or added to the collar at the pinion end by drilling or by lead casts in drilled holes, because an unbalanced armature would quickly destroy bearings and would not be efficient.

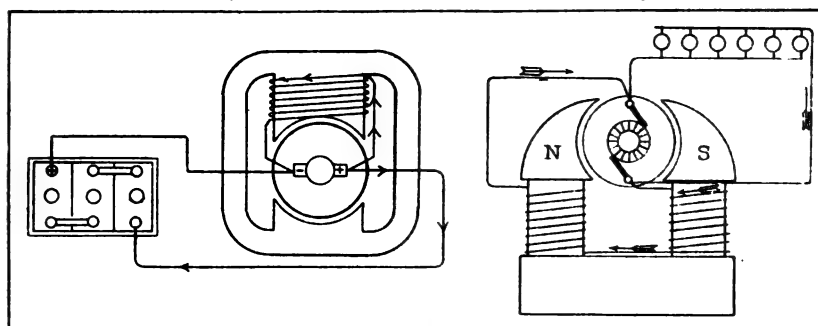
The armature shaft is fitted into the sleeve and is keyed or locked so that the assembly is practically one piece. The shaft is designed for the work the machine is built for, and it is usually as heavy as is possible so that it will not be sprung or twisted. This is mounted on either annular ball or plain bearings, ball bearings being preferred for generators, but in some instances plain bearings are used, as for starting motors, where the work is not continuous, although it may be momentarily heavy.

The Design of the Shell or Frame.

The frame or shell of the machine may be any form that will best serve the purposes of the designer, round, square, rectangular or hexagonal, because convenience in installation is sought, and besides this as solid a base as is possible to obtain is desirable. In some designs the pole or field pieces are machined from the solid metal of the frame, but in others these are made of soft iron laminae, so formed that there is a horn or flange that will retain the winding and which may extend parallel with the armature or at right angles to it. The tops or heads of the

pole pieces are shaped to have approximately the same contour as the armature, so that when the armatures are in place there will be the same space between all parts of them and the pole pieces. The space that is made for the armature in designing the machine is known as the armature tunnel. The clearance is small, probably not more than 1/32-inch in a small machine, and between the pole pieces and the armature is the flow of lines of force, which are cut by the armature windings and which develops the electrical energy that is collected by the brushes from the commutator and sent out through the circuit of which the brushes are the terminals.

The position of the brushes is very important. The brushes are carbon or carbon (graphite) coated with copper, and these are set at the neutral points of the commutator. The brushes are mounted in what are known as brush holders, these being small brackets that hold the brushes in exact position and the contact of the ends of the brushes with the commutator is insured by springs that are under tension and which cause a uniform pressure. The brush holders are adjustable for position with some types and are so



Diagrams illustrating a Shunt Wound Generator Field Winding and Connections, That at the Left for Charging a Battery and That at the Right for a Lighting Circuit.

constructed that the machine may be driven clockwise and counter-clockwise. The purpose is to have the brushes contact the full area, passing over each commutator segment in turn and collecting the current and converting it from alternating to direct.

(To Be Continued.)

An Overland, a Chevrolet, a Maxwell, a Ford touring car and a Ford runabout will be given away at the industrial exposition at Texarkana City, which is located on the border line between Texas and Arkansas. This free distribution of cars is not by any means an automobile advertisement, but a novel method adopted by the fair authorities to advertise the exposition and increase the attendance. The committee decided that the public would far more prefer the excitement and possibilities of getting a motor car than witness an ascension of a balloon or a few cheap vaudeville acts, consequently the plan to give away each day of the exposition one car will be put into effect Nov. 7-11 inclusive.

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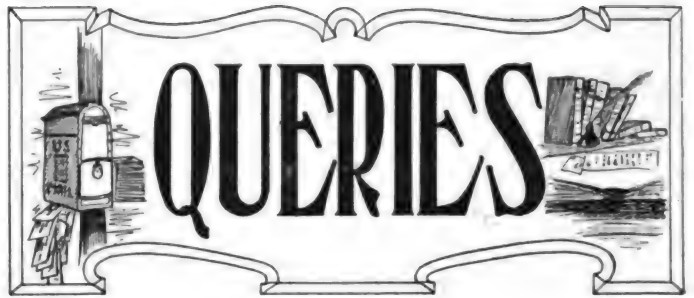
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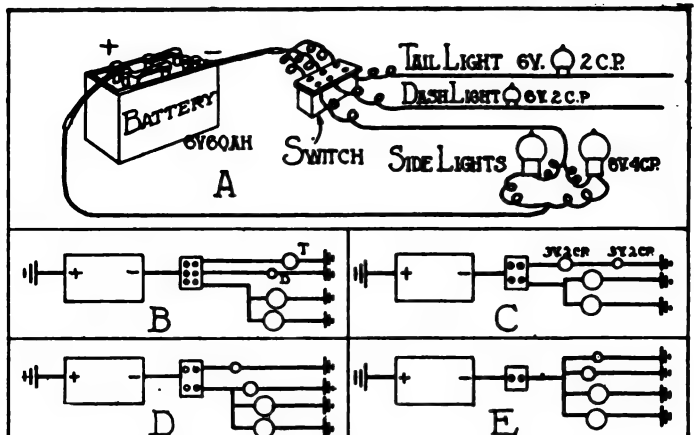
NOTICE TO READERS.

THIS department contains the Mechanical Editor's answers to readers' inquiries. It is open to every subscriber. If any part of your car is not operating satisfactorily, or if you desire information regarding operating, maintaining or repairing motor cars, do not hesitate to lay your troubles before him. He will answer promptly and fully, either by mail or in these columns, as you direct. This service is free to every subscriber, and is often the means of saving considerable money that otherwise would be spent with a garage man. Letters should always be signed with the writer's full name and address, and the car or part in question should be properly identified, by mentioning the maker's name, model, year of production or other distinguishing feature. Address all inquiries to the Mechanical Editor.

FORD WIRING DIAGRAM.

(J. F. U., Philadelphia, Penn.)

Will you kindly send me diagram or publish in your next issue of "The Journal" a diagram of wiring 1914 Ford for electric lights from storage battery, six volt 60 amperes. I want to convert my side lamps and tail lamp and add a small dash



Several Ways of Wiring a 1914 Ford Car for Electric Lights from Storage Battery.

lamp on a switch. While I have a general knowledge how it may be done and would try it out only my time is limited for such work.


There are several ways to do this and some of these we show so that you may select the one you think best adapted to your needs. Of course you realize that it must not be attempted to use the storage battery in connection with the Ford magneto as a means of keeping it charged. That magneto or generator is an alternating current affair, while storage batteries and charging dynamos or generators are direct current. So unless you anticipate installing a charging generator, it is a straight proposition of connecting the desired lights from a battery, which is what is shown.

Adapters for converting oil lamps into electric are procurable at most any automobile supply house and are easily attached. Also, it is possible to obtain a transformer for your headlights so that you can have a steady light at all speeds of your motor without the danger of the lights burning out at excessive engine speed.

The diagrams shown will be easily understood with the possible exception of the one where the dash light and tail light are in series. This is done to give a positive means of knowing that your tail light is lit. To accomplish this end

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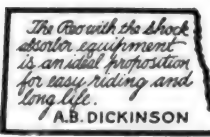
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three-volt bulbs are necessary, which are put in series with each other.

The first diagram shows each set of lights controlled by a separate switch using a two-wire system. The second (as well as the others) show a grounded system, i. e., using the frame or metal part of the car for the return circuit. While in this particular case it is immaterial, it is usually the custom to ground the positive or $+$ marked terminal of the battery. With a 60 ampere-hour battery any one of the wiring arrangements shown ought to run all the lights for about 23 or 24 hours continuously by using the Mazda C lamps.

"HOWLING" DIFFERENTIAL.

(C. H. W., Manchester, N. H.)

I am a reader your journal. Will you kindly advise me how I can get rid of the "howling" of the differential gear. When I had taken off the casing I found the pinion gear $\frac{1}{8}$ inch back after I had readjusted it. It began to "howl." I tried different ways. I have the master gear and pinion in line with each other and still it "howls." Do you think the pinion gear has worn and now I have put it in place do you think that is cause for the "howl?"

As your question is interpreted we understand that you took off the differential cover and found the pinion gear to be $\frac{1}{8}$ inch back from its proper place and that you adjusted it to a closer fit and after this it developed the "howl" you mention. While this in general sounds reasonable, there is no reason why the relative positions of the gears should change unless the adjustments for the same had become loosened or tampered with.

Two gears running in mesh are set so that their pitch diameters are in contact and they are designed to run quietly when this is so. When the gears have run for a long time they will, of course, wear some and usually in such a way that any change in their position will develop some noise until they have "run in" with each other again. While it is possible to eliminate some of the noise that de-

velops by adjustment, it is wise to install new gears if the wear is appreciable. This you can tell by noticing if the teeth are worn to a sharp point or badly "chewed." If you find these conditions we would advise getting new gears.

It is not well to put in one new gear to run with an old one. Either get a new set of the two gears or get a second hand set that is in good condition. This is often possible since there are so many dealers now tearing apart cars and selling the parts. If your car has a standard type axle you will have little trouble finding what you need.

Since you mention a "howl," it is more than likely that you have the gears too tightly meshed. Try adjusting the gears so they will not mesh so deeply into each other. If your gears were not tightly enough meshed, you would notice a distinguishable rattle, to overcome which, of course, you would have to adjust the gears so as to mesh further into each other.

It would be a good plan for you to wash out the differential case with gasoline, removing all grease and leaving all parts clean and bright, when you can see just how things are. Examine the bearings carefully. Worn bearings will affect the adjustment of course. Also it may be that the bushings of the small differential gears themselves are worn, which would tend to increase the noise of the rear end. However, unless the gears are badly worn we think by careful adjustment you will be able to overcome the noise you mention.

KEEPING MOTOR TAPPETS IN ADJUSTMENT.

(G. O. P., Albany, N. Y.)

Can you suggest some way to keep the tappets of my motor in adjustment? The tappets get to be quite noisy and after I have adjusted them so that they are fairly quiet they become noisy again after a short while.

While it may be that you do not tighten up the check nuts enough to hold the adjustment securely, it is more than likely that the ends are badly roughed up. When the valve



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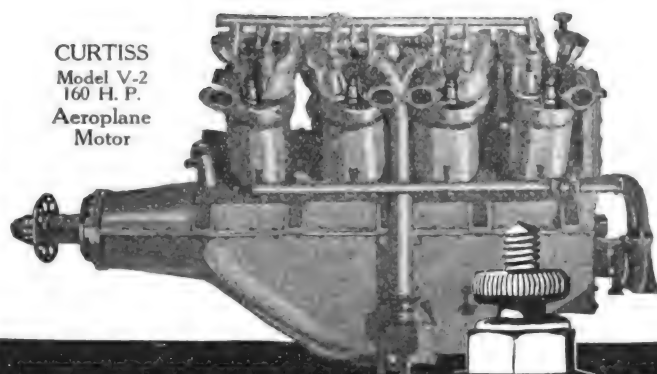
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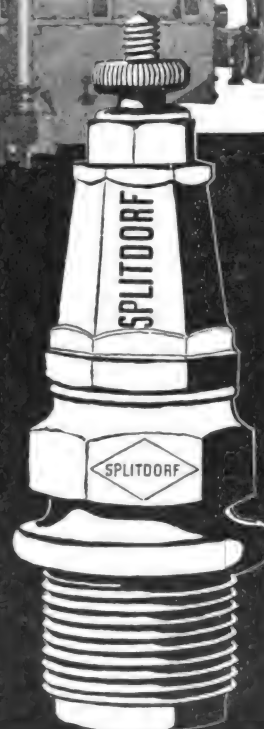
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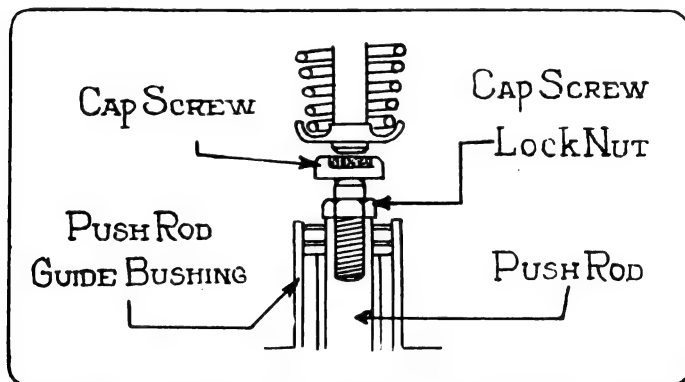
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stems have been allowed to hammer on the tappets for any length of time and without careful adjustment, the bottom of the stems and the top of the tappets, or adjustment nuts, become badly worn and pitted, making a good adjustment impossible, because when you have obtained a satisfactory adjustment for one relative position of the two pieces, the rotating motion soon upsets the adjustment.

The best way to remedy this is to grind off the bottom of the stems so as to give a smooth surface and do the same to the adjustment nuts. If there is any danger of not getting the surfaces flat and true by this operation, it is well to get new screws, which are inexpensive. Should it be, however,



Illustrating How to Keep Tappets in Adjustment.

that these are of a thread not readily available the same screws may be used by boring a recess in the top of the screw and inserting a piece of hard fiber as shown in the cut. This will not only render delicate adjustment possible, but will quiet the operation of the stems upon the push rods.

A MERCER AND A FORD.
(W. H., Overlook, Penn.)

As a subscriber to your interesting paper I would like in-
(When Writing to Advertisers, Please Mention The Automobile Journal.)

formation as regarding putting an electric light on the rear end of a Ford landaulet from the magneto and tell me if it can be done and how to connect the wires up to the regular lighting switch of a Ford car for the oil lights on a Ford are very bad. You have to watch them all the time, so I thought that electric tail light would be safer.

And could you tell me if a Master carburetor would give good service on a Mercer car, a 1913 model four-passenger car.

How do you connect a searchlight up to the Mercer car for the headlights or could I get better results from these headlights?

Can you give me a remedy for oil coming out the rear brake shoes of a Ford? I drilled a hole in the housing but that did not stop it and I have put new felt washers in also.

There are adapters for transforming oil lamps into electric lamps and they can be procured at automobile accessory stores. These do not prevent the oil lamp from being used should the electric system fail you. To utilize the regular magneto current for the tail light will generally be found unsatisfactory. You probably know by experience with electric headlights that at times they are very dim and then again they are often excessively bright. By the nature of the apparatus this is unavoidable without some change or added accessory. So if utilized to light the tail lamp you might at times find embarrassment in that it might not comply with the requirements of the law, besides the disadvantage of having no light when your motor is stopped.

To have a steady light in the rear either install a storage battery or a set of dry cells. These, of course, must be used independently and not connected up in any way with the generator, or magneto. However, should you, in spite of the disadvantages stated, desire to have the generator furnish current for the tail light, you can easily do so. You can either connect to the wire supplying the headlights at the switch for the same or you can connect at the source of current and have a separate switch for the tail light. The latter is recommended.

If your car is a 1915 or 1916 model get a bulb called G-6

18-24 volts. If the car is a 1914 or earlier get a G-6 12-16 volts bulb. If you wish a positive means of knowing if the tail light is working, install a small dash lamp in series with it so that it will burn or go out just as the tail light does. In this case get G-6 10 volt bulbs for 1915 or 1916 cars or G-6 6-8 volt bulbs for other cars. Connect as shown in illustration.

Regarding the Mercer car there is no reason why the Master carburetor should not give good results. While the manufacturers usually adopt a carburetor best suited to the needs of a particular type of engine, which decision is arrived at by a series of tests of the different makes of carburetors, it may be that recent improvements in design will give better results than were experienced when your motor was being tested. No doubt the Mercer Automobile Company, Trenton, N. J., can give you definite information on this.

Concerning the use of a searchlight there is no doubt as to the value of this in country travelling or touring. It is possible to run this direct from the battery to some connector set in the dash to which the spot light is connected as wanted. If there is a switch on the spot light itself it can be left connected and the light operated by means of this switch. This method of connection you will find to be the simplest and just as good as trying to connect through the main switches or connection block. It is very likely that you can bring about better results with your present headlights by attaching a device which will turn your lamps with the front wheels, always lighting the road where you are going. This



One can of NON-FLUID OIL equals in lubricating value 3 cans of common grease

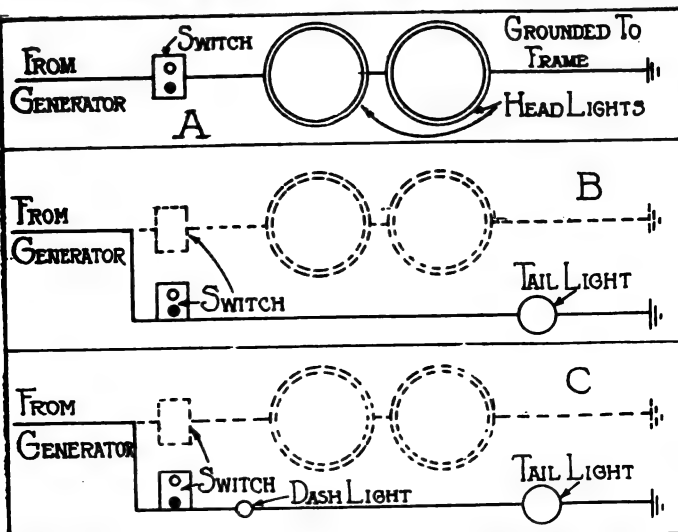
Common grease *does not* lubricate until frictional heat melts it. Then it leaks away. Grease contains fillers which *do not* lubricate. You pay for them but *do not* use them.



Lubricates the instant the car starts and continues lubricating every second the car is in motion. Doesn't melt at bearing temperatures—*stays* where it is needed—and *all* of it is pure lubricant. It lasts 3 times as long as grease and gives your car better protection against friction at less cost.

Get "K No. 00 Special" grade for gears; "K No. 000" for bearings. Sold only in orange-colored cans at your dealers. Write for samples and a new book "Lubrication of the Motor Car."

New York & New Jersey Lubricant Co., 165 Broadway, N. Y.



Suggested Wiring Plan for Installation of Electric Lights on a Ford Landaulet.

is especially important in going around corners, etc., and there are several of these attachments on the market.

The leakage of oil around the rear wheel brake band of your Ford can be stopped by using the correct size felt washers. These are made for just this purpose and if fitted snugly and properly retained will stop all leakage.


METHOD OF RELINING BRAKES.

(G. C. O., Pittsburg, Penn.)

Will you kindly oblige through your valuable columns by giving me an idea as to how to reline the brakes of my car so that they will fit closely and securely to the brake bands. Also will you please state what can be done to prevent grease and oil from leaking out through the brake drums and making the brakes hold poorly, besides gumming up the wheels.

A great deal of brake trouble is due to just what you have mentioned; viz., grease leaking from the differential housing through the axle tube and thence into the brake mechanism. Although practically all axles are provided with some means of preventing this leakage, some of it will often get through, especially if the differential case is too full. Illustrated at "A" is a simple means of remedying this difficulty for a time at least. Cut from a thick pad of felt a strip that is long enough to be wrapped around the axle bar three or four times. This felt should be thick enough so as to fit snugly

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Safe Garage Heater

A Wonderful New Invention. No Gasoline Fumes Can Enter Heater - All Air Brought From Outside Building.

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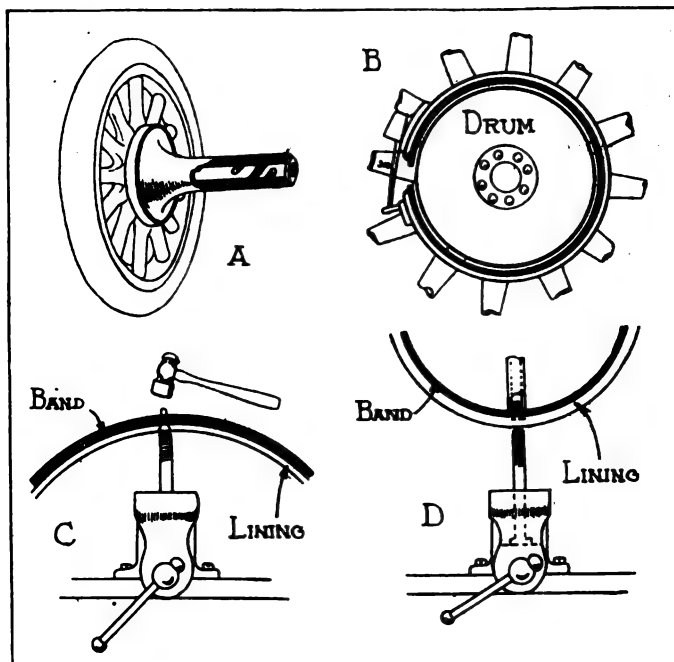
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between the axle shaft and housing and wrap itself around the shaft as shown. This will afford a temporary relief from the trouble, but should be properly replaced when convenient with the correct sized felt washers held in place by the proper retainers. We would suggest that you wash out your brake system with gasoline and try this.

If you think then that your brakes need lining they should be so repaired. In doing this it is usually necessary to take off the brake bands. The instruction book furnished with your car will show how to do this, but remember how the bands come apart and their relative positions and locations, so as to be able to get them back in place properly.

Having gotten the brake bands off the next thing to do is to remove the lining from these. To do this put the band in a vise and with a cold chisel and hammer cut off the ends of the copper rivets, which then can be punched out with a punch or good sized wire nail. The lining will now come off freely.

The next thing is to get the new lining correctly placed and holes bored therein. First, let us consider the outside band or foot brake. Lay the new lining along the drum of the wheel that it goes on and put its proper brake band against it. Draw this up tight by means of a wire as shown and twist it to hold it in place. (See illustration "B.") Now mark through the holes in the band on the lining with a punch or chalk or little dabs of red color where the holes



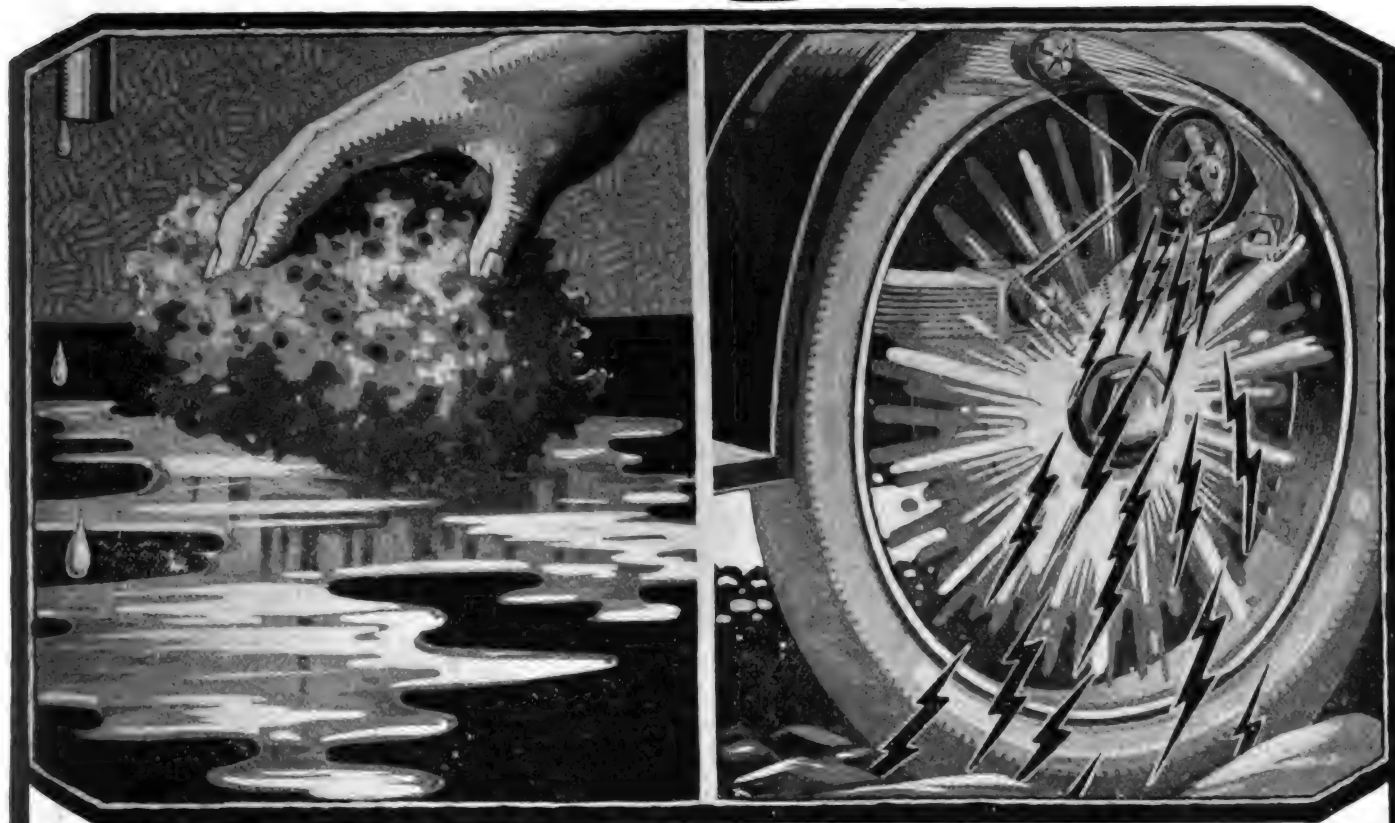
Operations Necessary in Relining Brakes.

come. Remove the band and lining from the drum and drill through the lining at the proper places, or you might use a harness maker's punch of the right size. Use a countersink tool in a bit brace and countersink the side of the lining that is to come in contact with the brake drum or friction surface. Now lay the brake lining on the band so that the holes correspond and insert the rivets. Copper rivets of the size of hole in the band should be used and the ends should be about 3/16" extension after the heads are set in the lining so there will be no contact of rivet with drum.

To rivet these in place start at one end of the band and set the rivet head against the end of a bolt or iron rod held in a vise. (See "C.") Now with a hammer or a hammer and rivet heading tool set the rivet up tight by a few quick light taps. This is better than fewer heavy taps. Do this to the next rivet and so on in order until that band is finished and then do the other foot brake in the same way.

The other brake band lining will be found easier to put on, as in this case it is not necessary to lay it along the wheel drum, but just along the outside of the band. Proceed in a general way as before. (See "D.") Be careful in replacing the bands and the wheels that the brakes do not bind anywhere, and that everything is put back correctly in place.

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Send for booklet, "*Between You and Jolt, Jar and Vibration*," and learn how to make your car much more comfortable. Mention make, year and model.

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ACCESSORY AND GARAGE JOURNAL
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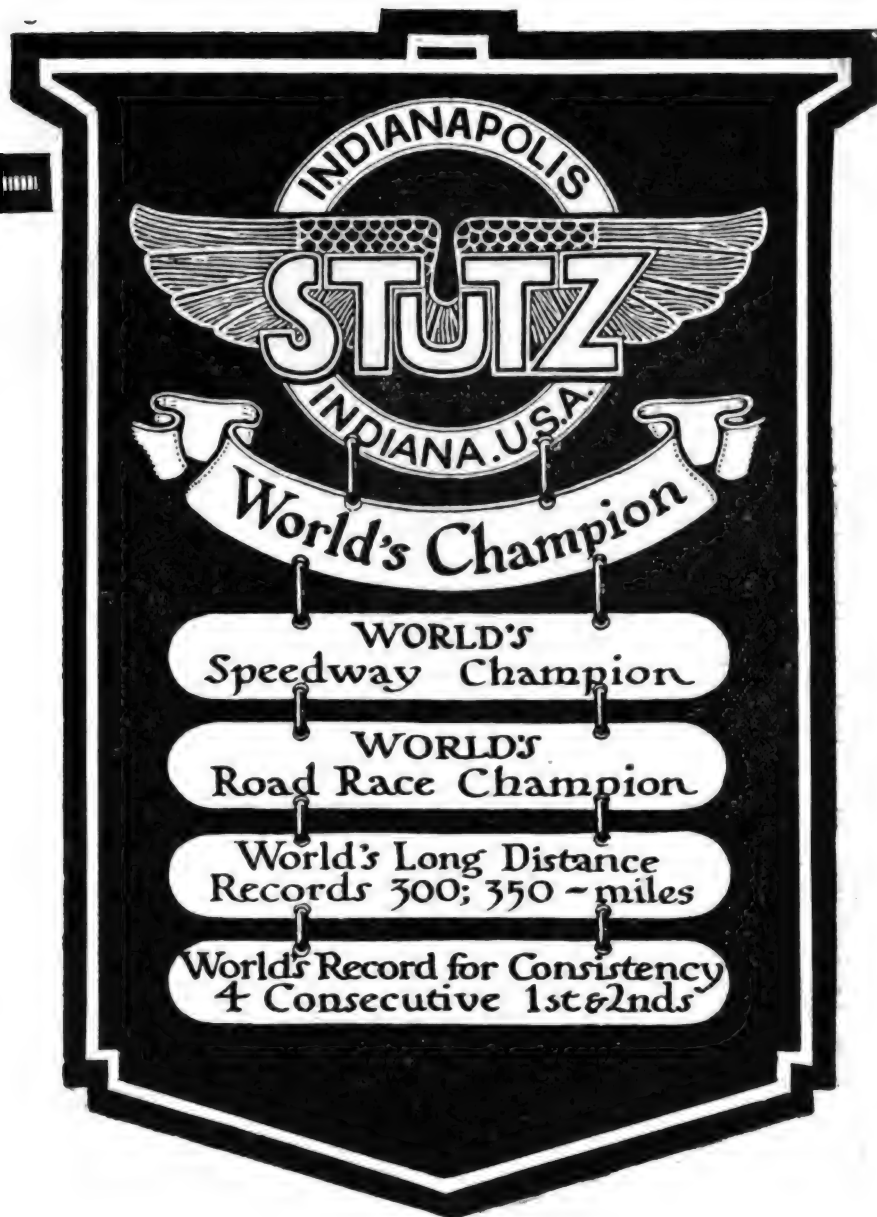
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Industrial and Mechanical Engineers, 1223 Filbert Street, Philadelphia. Develop, Market and Finance Patents. Reorganize Industries.

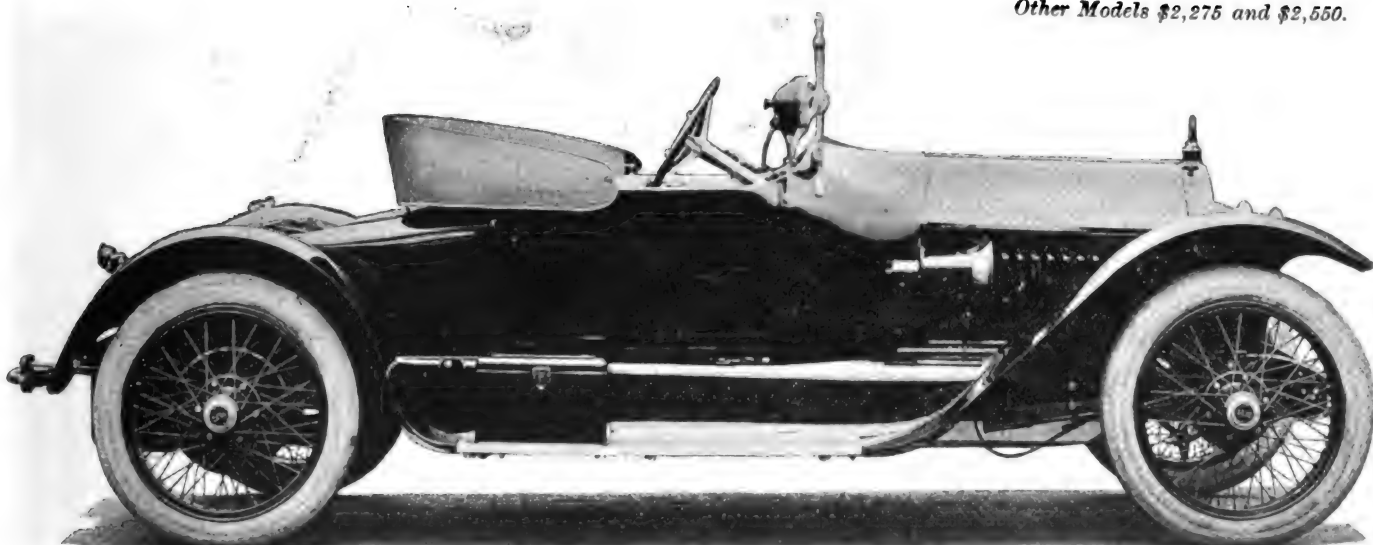
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Stutz Racing Records are unequalled after two years of competition by the better motor mechanisms of America and Europe, for the same reason that the Sturdy Stutz is giving unequalled service in owner's hands.

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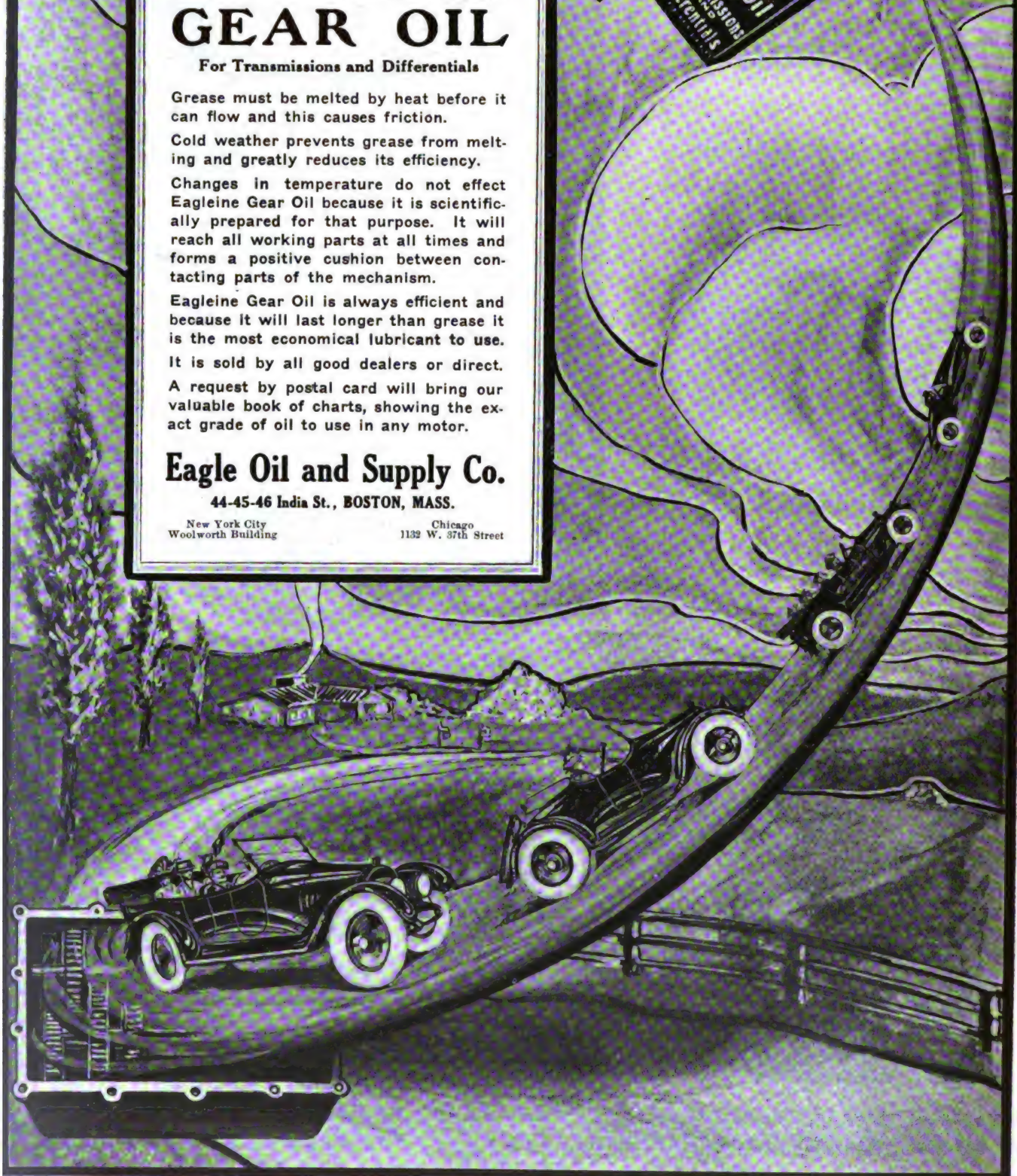
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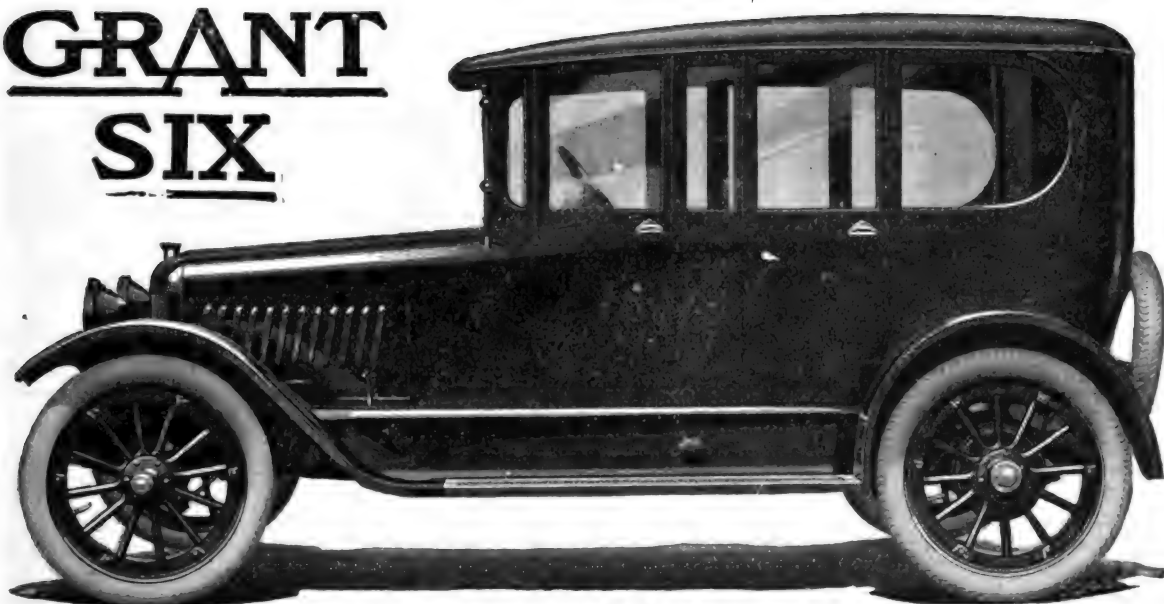
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GRANT SIX



This shows the Grant Six with new winter top. A sensible, comfortable, distinguished car. The sash can be removed quickly making a permanent top convertible type car.

Buy Your 1917 Grant Six Now—and get it with the New “All-Year” Top

THE Grant Six is the first car in its class to announce its 1917 Models. You can buy your 1917 Grant Six *now* with the Sedan Top fitted on at the factory and enjoy snug comfort all winter. When spring comes you will have the very latest in style and design.

The Grant Six Roadster Sedan top looks just as attractive as the Touring car illustrated. Both are the neatest and handsomest you have ever seen.

They blend into the body lines and look as if especially designed because they are especially designed—and built for the Grant Six exclusively. Hand-tailored, as it were, and incorporating the very latest ideas in interior trimming, lighting and ventilating.

We suggest ordering your new Grant Six now and having it shipped from the factory with the new Winter Top fitted, thus securing a perfection and unity of equipment not to be had where the car and the top are purchased separately.

Touring Car with Winter Top...\$1000

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Quality Construction Plus Quality Action

The 1917 Grant Six is the snappiest, liveliest, quietest operating and best looking Six ever sold for its price.

You have only to compare construction and action to convince yourself, that when it comes to quality and performance there is a wide gulf fixed between the Grant Six and any car near its price.

See your Grant Dealer at once or write to the factory for the latest catalogue.

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All prices f. o. b. factory.



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a Copy

VOL. XLII.

OCT. 25, 1916.

NO. 6.

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Treasurer . . WILLIAM H. BLACK
Secretary D. O. BLACK, JR.

Published the 10th and
25th of each month by the

AUTOMOBILE JOURNAL PUB. CO.,
Times Building, Pawtucket, R. I.

MAKERS and Distributors of motor cars have this year more generally come to recognize the value of exhibiting their machines at state and county fairs. It has taken more time than seems reasonable for the majority to realize the value of such exhibitions, the fairs up to the year 1916 having been slighted to a great degree. However, this fall has witnessed a very large number of makers and distributors participating, and judging from the results obtained the fall of 1917 will be a record breaker for the outdoor automobile exhibition.

IT WOULD seem that the car manufacturers have regarded the state fair as a place of exhibition for only horse vehicles, vegetables and farm animals. The first to realize in large measure the value of such fairs as logical exhibition grounds and the great selling field that existed among the attendants were the makers of agricultural tractors, which is natural because their selling field is specifically among the agricultural workers that visit the outdoor fairs. The success of the tractor demonstrations this year gave the automobile manufacturers a much needed "jolt" and awakened them to the field that they were overlooking.

ONE Prominent Dealer in pleasure cars condensed the situation in a single statement. He said: "I believe in exhibiting at state fairs because the fall season is the logical time for exhibiting the new models, not the winter when the models have been on the market for six months or more." There is another reason, of which he probably was aware, but did not voice, and that is that at the time the state and county fairs are being held the farmer, who as a class makes up the largest proportion of the attendance, is then in possession of money realized on the sale of his crops.

THE National Winter Show, of course, have their own great value, especially among the residents of cities, and there is no logical reason why the two classes of exhibitions cannot be maintained at a large profit to both exhibitors and spectators. From indications at present the show season of 1916-17 is to be the greatest ever known in the industry. Three months before the opening of the New York show it was announced that more than 100 makers of cars had taken exhibition space, and these do not include those "last minute" exhibitors who usually crowd in on the eve of the opening.

AS IN the Past the readers of The Automobile Journal will be treated to special show numbers, they containing complete specifications of all the cars being manufactured, including the 25 or more new ones that have been announced within the past few months. Another feature of the numbers will be the complete and interesting advance notes and the reviews of the New York, Chicago and Boston shows. There will also be special articles, showing the tendencies in chassis and body designs as shown in the new 1917 models. Each number will be a complete guide book for each show covered and each will be well worth the price of a year's subscription.

THE Joys and Benefits of touring in Cuba are not generally realized by North American motorists. That land, which is but a short distance from the mainland of the United States, has about 1500 miles of the finest kind of roads and a climate and scenic grandeur that cannot be surpassed anywhere in the Western Hemisphere, nor in Europe. Cuba's lures for the motor car owner are described and illustrated in the leading article of this issue.

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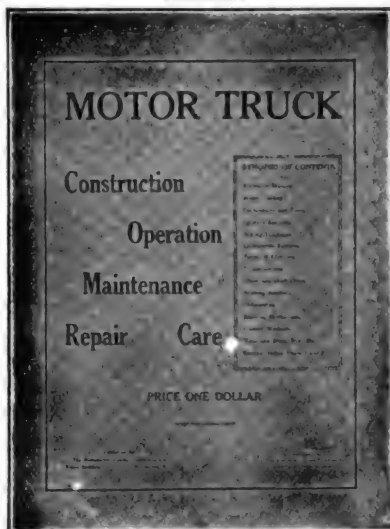
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All recent trans-continental records made by cars equipped with A C Plugs.

A C Plugs are made for all types of motors. They insure highest efficiency at all speeds. Throttling down better and on quick pick-ups will get away swiftly and smoothly. Is your car equipped with A C Plugs? If not, you are not giving it a fair chance. Accept no spark plug unless A C is burnt into the porcelain.

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WONDER-MIST has passed the most rigid tests in libraries, churches, clubs, hotels, theatres—has made good with hundreds of jobbers and dealers and with hundreds of thousands of car owners.

You Spray It On

—the quickest, easiest and most economical way to clean a car. Spraying with WONDER-MIST penetrates and dissolves all dirt, mud and grime, acting as a lubricant to protect the finish from scratching or injury. A few rubs with cheesecloth and you have the finest polish imaginable without streaks, etc.

WONDER-MIST keeps the new car new—the old car from looking old—should be used on every car before it is put in service. It prevents rain streaks and mud spots. Non-inflammable, non-combustible, non-poisonous. Safe to use anywhere—any time.

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THE GRIP THAT GRIPS



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Others take a chance with
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Does it pay to gamble with
something on which your
life depends?

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THE Automobile Journal

VOL. XLII.

OCTOBER 25, 1916.

NO. 6.

Touring in Cuba, the "Pearl of the Antilles."

This Neotropical Land of Sugar Cane and Tobacco, Is An Ideal Touring Ground for Motorists Between the Months of November and April, The Time When the Roads of the United States Generally Are Covered with Snow or It Is So Cold as to Preclude Comfortable Highway Travel In Northern States.

CUBA has for the motor tourist a charm that cannot be equaled anywhere else on earth. Rolling through its beautiful mountains and valleys and exquisite flora, is undoubtedly the height of luxury for the motor car owner who lives in the United States, but where expense and time are not a consideration the motorist will find unsurpassed environment in which to indulge himself on the beautiful white highways that radiate out from the principal cities of Cuba and criss-cross the island from the north shore to the Spanish Main.

Cuba is no longer the land of the machette and revolutions. In reality it is a gigantic nursery, where a wide variety of vegetable life, both useful and ornamental, grows in great profusion. The flora is unexcelled, teeming with all the colors of the spectrum and enlivened by gaily plumed birds, whose colors, for grandeur and gaudiness, are only second in beauty to the brilliancy of the flowers.

"The Most Beautiful Island."

Thousands of travelers have sung Cuba's praises and authors throughout the world have written of its magnificent scenery and beauty, but probably the most cherished description of this island garden is that given by Christopher Columbus, who said of it: "The most beautiful island that human eyes have ever seen." Whether or not there is a more beautiful one is irrelevant, as for the enjoyment of the motorist it would have to have roads equally as good as those in the "Pearl of the Antilles."

The roadways, which are better described as boulevards, call for ecstatic descriptive terms to properly picture their magnificence. Extra wide and evenly out-



The Royal Palms of the "Pearl of the Antilles" Which Abound in Cuba and Are to Be Found Aligning All the Public Highways. This Scene Is Just Outside of Picturesque Matanzas on the North Coast and East of Havana.



The City of Havana from Cabanas. In the Foreground Is Evidence of the Century-Old Spanish Regime, the Ancient Cannon Having Guarded Havana for Many Generations.

lined, these white highways wind through mile after mile of royal palms and foliage toward vistas which always seem just out of reach. It is seldom that any acute curves are encountered and the grades are always gradual, infrequently exceeding five per cent. Neither the painter of word pictures, nor the landscape artist could do justice to a scene from one of these boulevards, looking toward the hills with the pale azure sea in the background and the intensely luminous sky overhead.

Cuba's Climate Very Salubrious.

Aside from its wonderful scenic beauties, Cuba has a climate that is exceptionally healthy and pleasant. In fact,

the island ranks as the second healthiest country in the world, having a death rate per thousand of only 12.69, while that of Australia is 12.60. There is a general impression that the rain fall is excessive, but official figures place it at only 54 inches and most of this falls in the summer time. In winter the weather is dry and the average temperature in January is 70 and the lowest 60 degrees. The lower temperatures prevail during the evening. During the day time in winter the refreshing breezes from the sea make motoring particularly enjoyable.

With an environment and climate as described and over 1500 miles of beautiful roadways, and many miles of these

shaded by trees and foliage, the attractiveness of the island for motor touring is easily apparent. While a trip to the island for a motor tour will be found quite costly, it does not involve any great trouble or inconvenience, as the Cuban people and authorities are extremely courteous to foreign visitors and seek to aid their comfort in every possible manner. It is not necessary to understand or speak Spanish in traveling about the island. The aid of natives in finding locations can easily be secured through making gestures or employing a pantomimic method of intercourse. They are particularly adept at this means of communication.

No Entry Fees or Duties.

There is no duty or entry fee charged a foreigner for bringing in a motor car to be used by him personally for touring, although he is obliged to give a bond of not less than twice the amount of the regular duty charged in case the machine was brought in for the purpose of sale or lease. The owner of the car is then allowed to remain and use his car for a period not to exceed six months without incurring any taxes, license fees or other charges. As the winter touring season lasts from November into April, which period affords ample time to thoroughly tour the island and visit all the interesting places, there is little need of a more extensive time allowance for the visiting motorist.

In carrying cars to the islands it is the best plan to arrange with some reliable broker to handle the car from the steamboat until it has passed inspection by the revenue officials. Lighterage fees are charged in taking cars from the steamers and the red tape that is incidental to placing the car in service is thus avoided. No license or examination is required of the driver of the car, it being taken for granted that he is com-



Modern Cuba, Showing the Influence of North American Ideals That Came After the Overthrow of Spanish Rule in the Spanish-American War. This Building Is the Produce Exchange in Havana.

petent. This principal of leaving the motorist upon his honor in observing the regulations and laws governing the use of motor cars is carried out to an unusual extent by the authorities, particularly in the case of foreign visitors, but flagrant violations, with disregard for the rights of the populace, are not overlooked with like leniency.

In Havana the speed limit is fixed at eight miles an hour, while on the outside roads immediately adjacent to the city the limit is 12 miles. In the city there are also "one way" regulations, similar to those prevailing in this country, but on the highways leading through the country there are no exacting conditions to be observed except that the motorist should exercise care and judgment in operating his machine. People encountered on the roads will always be found ready and willing to give directions to a touring party providing they can be made to understand what is wanted. There is little occasion for becoming confused in traveling on the island; the roads lead to and from the large cities, where comfortable and hospitable quarters for a night stop can be found.

Two Kinds of Currency.

On long tours it is advisable to carry luncheons, as at the smaller places along the highways it is difficult to procure anything except drinkables that would appeal to the appetite of an American. Spanish silver is carried by most tourists, with which to pay incidental expenses. This currency is in use by the natives throughout the island, although Cuba now has a national coinage system similar to that in use in this country, with coins in denominations of one, two, five, 10, 20 and 40 cents and \$1. They also have \$5, \$10 and \$20 gold pieces. This money is now used generally in the cities.

There are 17 cities on the island, with



The New \$3,000,000 Central Station in Havana. The High Iron Fence Shown Here is Typical of the Surroundings of the Majority of Public and Government Buildings in Latin America, and Reminds One of Turbulent Days of the Past.

a population of over 10,000 people, and they are all connected up by road. Havana is the largest, having a population of 350,000, while Matanzas and Cienfuegos each have a population of 75,000. Camaguey is the fourth city in size, having 68,000 population; Manzanillo fifth, with 56,000; Santiago sixth, with 55,000. There are four other cities with over 40,000 population. The total area of the island is 44,164 square miles and the total population is estimated at 2,467,883.

The trip to the island can be made by steamer from many different points in the United States. Regular sailings are scheduled by several lines from New York to Havana and some other Cuban ports. It only takes four or five days by those lines, while others sail from Boston, Norfolk, Mobile, New Orleans, Gal-

veston, Tampa and Key West. From Key West, which is the nearest point in this country to Havana, the trip by steamer takes but a few hours. The latter route is preferable at this time of year, it affording the motorist an opportunity of touring down along the coast of Florida through the beautiful beach resorts.

Points of Historical Interest.

Havana is the principal city, chief seaport and capital of the Cuban republic. It is the oldest city in the Western hemisphere and as such naturally creates an inquisitive interest, because there was founded the first permanent settlement of European members of the Caucasian race known to history. It was founded as a city first in 1515 and again in 1519 on its present site, but did not become the capital of the island until 1552. Pre-



Even the Cart Roads in Cuba Are Broad, Smooth Highways, with Slight Grades. This View is at the Western Entrance to San Antonio de Los Baños. The Ox Cart Recalls Biblical Times.



The Famous Valley of Yumuri, in Which Are the Monserrat Hermitage, the Caves of Bellamar and Beautiful Matanzas, Standing on the Side of a Sloping Hill and Fronted by a Placid Bay. This Valley is Lined with Marvelously Smooth Roads.

vious to that time the seat of government had been located at Baracoa and Santiago De Cuba. Antidating as it does all the other municipalities in the "new world," as Columbus styled it upon his return to Spain, the student of history might spend weeks within its charming atmosphere, never tiring of the real historic places and lore that is to be found in the archives of the public institutions.

Almost every type of architecture is represented in the many public and private buildings throughout the city. Renaissance, Gothic, Elizabethan, Doric and Moorish designs are found in magnificent structures, and many of the private homes present even better and more elaborate examples of architectural styles than are to be found in the public buildings.

The official home of the President of the Republic is a veritable palace, while there are other residences of almost equal grandeur. They are mainly one or two stories in height, with thick walls, and are built with a court in the centre, where there is either a pool, plot of flow-

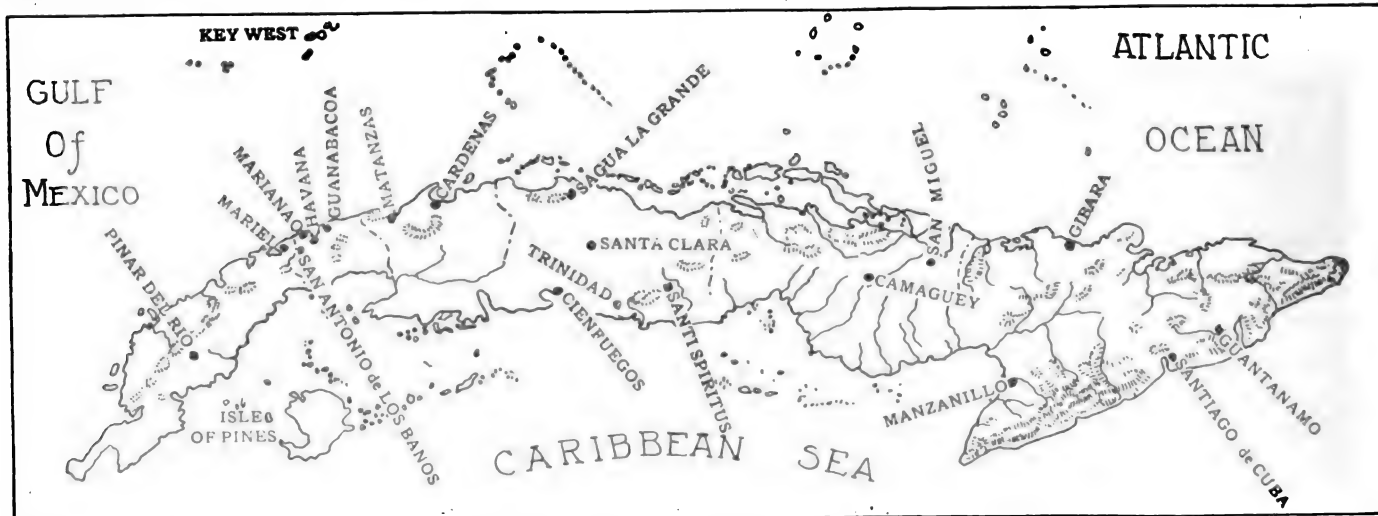


Cuba Has About 1500 Miles of Magnificent Shaded Automobile Roads, the Majority of Which Are Like This Stretch.

ers or large palm. About the houses in most instances are gardens of palms, flowers and vines that would put to shame the best efforts of the landscape gardener in the North.

Among the notable examples of beautiful architectural types are the convent of San Francisco, the House of Representatives, National Theatre and the two markets, Tacon and Colon.

In the accompanying photographs of scenes in the island, which were furnished through the courtesy of the Pan-American Union at Washington, D. C., one gains a good impression of the charm of not only Havana, but of other beauty spots of the island of Cuba. Nature's hand has moulded its topography into a vast garden and in turn the environment has moulded the temperament of the people who live in that garden in keeping with their habitation. The natives of the island are largely descended from the men who settled it 400 years ago and have personalities and manners as flowery and charming as the land they inhabit.



Cuba and the Relative Locations of Its Principal Cities, All of Which Are Reached Over Excellent Government Highways That Are Better Described by the Term Boulevards.

ROADS BILL UP IN NEW JERSEY.

Egan Bill a Big Factor in Deciding Some Results in the Coming Election.

At the coming election in New Jersey the voters will have the opportunity of adopting the Egan bill, creating a highway commission and providing for a \$7,000,000 bond issue for the improvement of 13 main highways.

The bill provides that all the bonds are to be repaid out of the funds collected from the motor vehicle registration fees, driver's licenses and fines collected by the state. It also provides that the main routes, "shall be paved with granite, asphalt or wood blocks, brick, concrete, bituminous concrete, asphalt or other pavement having a hard surface and of a durable character."

In 1892 New Jersey adopted state aid in road building and the state for a while held the first position in the percentage of improved roads to the total mileage of roads in the state. Rhode Island, Massachusetts, Ohio and Indiana have since outdistanced New Jersey, but it is expected that through the adoption of the Egan bill the state will be able to regain the first position again.

"TANKS" NOT AMERICAN.

One of the members of the firm of Gaston, Williams & Wigamore, a big export house, with branches in England, who have sent abroad millions of dollars worth of automobiles and trucks since the war opened, denies that the machine known as the "tank" with which the allied armies wrought such havoc at the battle of Combes, was made in this country.

George Gaston of the firm says that the "tanks" are a British invention, made in England by English workmen and machinery and that they are not in any respect an imported product.

A. L. A. EXPANSION.

At a recent meeting in Boston of the directors of the American Legal Association, it was voted to extend the work of the organization into the State of Connecticut and it was decided to open a branch office at Hartford.

It is also proposed by the directors to develop a "department of highways" in the association for the purpose of improving connecting links between the present state highways throughout the New England States. The assistance of city and town authorities will be sought in eliminating dangerous curves and corners, by reducing ledges, sand banks and shrubs. An attempt will also be made to secure information concerning road conditions, construction and detours and in assisting in laying out such detours. Some of the other points to be considered by this department will include: Gathering of statistical information from disinterested sources that would be available in considering legislation, the

securing of such information as may be necessary to reduce, and so far as possible, eliminate accidents which occur at dangerous curves and corners, and on narrow roads, many of which accidents might be avoided by making some such roads one-way streets, as well as the securing in every possible way of more favorable conditions as relate to motoring.

The department will be placed in charge of a competent engineer and the members of the association will be called upon to offer suggestions for the conduct of the work.

ALLEN "CLASSIC" WINS PRIZE.

At the Tennessee State Fair in Nashville, Tenn., the first prize for cars selling under \$1000 was awarded to the Allen "Classic." The car was driven by Mr. Allen, one of the Allen factory representatives, and he had as passengers Miss Alice Davis, Miss Florence Davis, Miss Willie Mai Pugh and Duncan R. Dorris. The Nashville Motor Car Company of Nashville, which recently became Allen distributors, exhibited the car.

ELGIN ON WILD TRIP.

An Elgin Six, five-passenger touring car, recently made a trip through the northwestern section of Minnesota from Little Falls to Stockwood and return over a trail that was so indefinite that the driver had difficulty in following it. The country traversed was of a wild character, and the route lay through creeks, mud, sand and over steep hills,

but despite this fact an average speed of 29.4 miles was maintained for the trip, which totaled 400 miles. The car came through without an adjustment or break down, although the going was rougher than would ever be encountered on the average motoring trip throughout almost every mile. In one place where the car emerged from a thick wood it unexpectedly dashed into a creek, throwing a shower of spray over the occupants.

CHICAGO USED CAR SHOW.

The Chicago Automobile Trade Association will hold a used car show at the Chicago Coliseum during the week of May 8-14 next year. The exhibitors will draw for space, which will be sold at 40 cents a square foot.

FREE TOURING INFORMATION.

The Hoosier Motor Club of Indianapolis, Ind., the Automobile Club of St. Louis, Mo., the Cleveland Automobile Club of Cleveland, O., the Columbus Automobile Club of Columbus, O., have joined a movement restricting the distribution of touring information indiscriminately to all applicants.

The distribution will hereafter be made by these clubs under the following plan:

"Members of motor clubs, resident or non-resident, to receive touring information free, upon presentation of membership card.

"Non-resident non-members to be supplied with free touring information, as in the past. The club supplying such person with touring information shall take his name and address and forward same to the secretary of the motor club to which he should belong.

"Resident non-members to be refused touring information at any price, except the price of membership."



CROSS-COUNTRY TEST OF AN ELGIN SIX.

Here is Shown a Sample of the Going Encountered and Mastered in the Run Through Northwestern Minnesota on a 400 Mile Trip.

How They Finished At Chicago.

Car	Driver	H. M. S.	M. P. H.	Prize
Peugeot	Resta	2:24:16.68	103.99	\$6000
Peugeot	Aitken	2:24:32.61	103.65	3000
Maxwell	Rickenbacher	2:25:52.76	102.08	1500
Premier	Lewis	2:32:28.93	98.37	1000
Maxwell	Henderson	2:32:31.39	98.34	900
Premier	Galvin	2:33:20.50	97.81	800
Duesenberg	De Vore	2:45:35.43	90.58	600
Ogren	Burt	2:49:25.90	86.66	500
Erbes	Gable	3:04:52.23	81.13	400
Hudson	Vall	3:05:37.37	80.81	300

DARIO RESTA recovered his place at the head of the list of American race drivers for championship honors by winning the Grand American race at Chicago in his Peugeot and, incidentally, won his sixth straight victory on the Chicago motor speedway.

The time made for the 250 miles was not as fast as that established at the Astor Cup race at Sheepshead Bay, but the race was far more interesting, being closely contested and furnishing many spectacular incidents.

Johnny Aitken, in another Peugeot, made the race especially exciting, as he had wrested the laurels from Resta by winning the Astor Cup race and placed himself in the lead for championship honors. Resta's victory, however, gives him 3200 points, while Aitken has 2940 for the championship, the Bosch trophy and the cash prizes offered by other accessory manufacturers. Resta crossed the tape in 2:24:16.68, at an average speed of 103.99 miles an hour, while Aitken crossed 6.9 seconds later, his time being 2:24:32.61, an average speed of 103.65 miles an hour.

Rickenbacher, in a Maxwell, who had fought the two leaders throughout every mile of the race, took third, but he was over a minute and 20 seconds behind Aitken when he finished.

During the first 100 miles De Palma led the field and the pace was terrific, with Aitken, Resta and Rickenbacher hanging on so close that the leader's position was only maintained by tremendous bursts of speed on the stretches. Before the 200-mile mark had been reached, however, De Palma went out with a broken valve and the race became a three-cornered contest.

Out of 19 starters 10 finished. Eight went out because of various mechanical troubles and Rawlins, in a W. Duluth Special, was flagged at the finish.

Resta made a brief stop at the pits in the 190th mile, changing a tire and taking on gasoline. Aitken also made one stop, but it was of a highly spectacular character and was made at a time when he was leading Resta, a fact which many of his friends ascribed as the reason for his not winning the race. When a right rear shoe blew out on Aitken's car he started for the pits while still going at a very high speed. His car started to skid and turned completely around before he regained control and started for his pit in low gear, going in the opposite direction. While the car was skidding up the track for a distance of 100 feet it ap-

peared for the brief period that an upset and fatality were inevitable. His helpers replaced the tire within 30 seconds and started him off with the Peugeot still facing in the wrong direction.

D'Alene's Crawford furnished another period of excitement, but with more serious consequences, his mechanician, Hetlich, being so severely burned it was doubtful if he would survive. D'Alene visited the pits for a supply of fuel and while his engine was still running gasoline was poured into the tank, a considerable amount running over the edge of the opening and becoming ig-

nited by the exhaust. The flames rose high in the air and the mechanic's clothes caught on fire. The pain from the burns became so severe he was temporarily crazed and ran up the track, where he fell over the barrier in front of the judges' stand before he could be reached and the fire in his clothes extinguished.

The fire extinguisher crew on duty at the track put out the fire on the car and D'Alene started into the race again with another mechanic, but he went out for good in the 90th mile with a broken shaft.

The other Crawford, driven by Klein, also went out with a broken crankshaft at 112 miles. Milton pulled his Duesenberg out of the race in the 42nd mile owing to clutch trouble and Buzane's Duesenberg was retired at 60 miles, as up to that time he had been obliged to visit the pits four times in an attempt to remedy a persistent leak in the water pump. Hughie Hughes, in a Hoskins Special, was the first one to drop out of the running, a broken connecting rod disabling his machine in the 40 mile circuit.

Giant's Despair Hill Climb Results.

The free-for-all event in the Giant's Despair Hill climb at Wilkes-Barre, Penn., was won by Fred Junk in a Chalmers Six. Besides the \$1000 Hollenback trophy, Junk also was awarded the Philadelphia Press trophy. He also won another cup by taking first in the sixth event. In winning the race he made the fastest time of the day, covering the course in one minute and 41 seconds. The course is 5700 feet in length and rises 690 feet in that distance.

There were eight events on the programme, but only seven were run off, as the Saxon, the only entry in the first contest, did not finish. The second race

was won by Durham in a Maxwell. In this event, which was for cars stripped of fenders, running boards and windshields, Junk came in second despite the fact that he blew a spark plug at the start.

Haines in a Mercer took the third event and Hohl in a Packard the fourth, while Durham in his Maxwell took the fifth, which was his second victory for the day. Junk won the sixth event and the free-for-all, which was last, the seventh event, being taken by Al Hughson in a Pathfinder Twelve. This race was a non-stock class event with a piston displacement of 450 cubic inches.



Fred Junk, Winner of Two Firsts in the Giant's Despair Hill Climb, in His Chalmers Racer, Stripped for Action.

Fashionable and Comfortable Fall Motor Togs.



A Very Modish Costume for Any Purpose Wear. The Coat Is Made of Acacia Rencontre and Is Cut Along Very Distinctive Lines and Is Suitable for Matron or Maid.
(By Shatz & Co., N. Y.)



For Informal Outdoor Occupations and Recreations This Blue Striped White Flannel Blanket Coat Will Be Found Very Convenient. Especially in the Motor Car When the Day Is Blustery or Snowy.
(Abercrombie & Fitch, N. Y.)



Below Is a Snug Fitting Cap of Brown Corduroy Trimmed with Brown Satin That Is Ideal for Cold Weather Motoring. Corduroy is in high favor this year.
(By T. Eaton & Co., N. Y.)

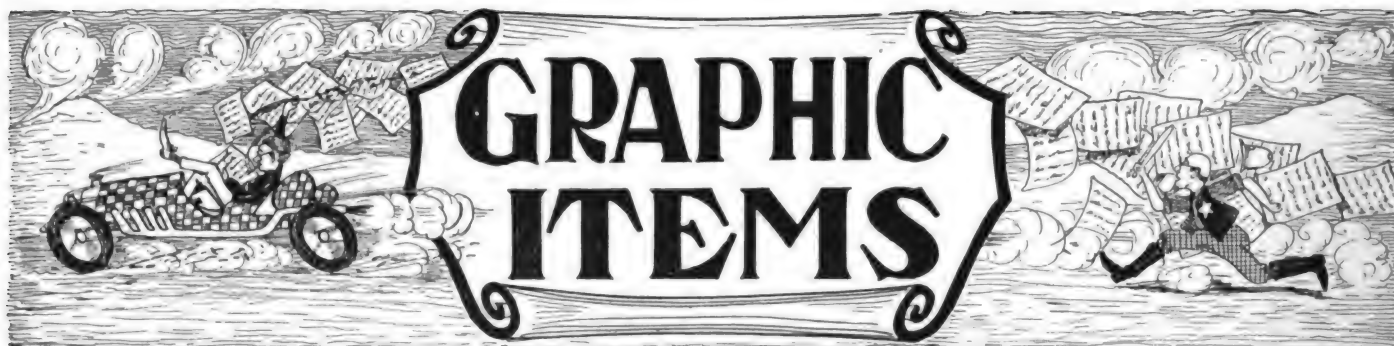


Very Desirable Is This Trim Automobile Hat of Muskrat. It Can Be Worn with Almost Any Outdoor Outfit and Be Appropriate for the Occasion. It Is Particularly Fitted for Wear with Fur Coats or Fur Trimmed Suits.
(By T. Eaton & Co., N. Y.)



Combinations of Broadcloth and Fur Lend Themselves to Effective Costumes for Both Street Wear and Motoring. The Coat at the Right Is a Combination of Broadcloth with Bodice of Beaver and Large Beaver Cuffs and Collar. Finished with Unique Belt Buckle.
(By Hickson & Co., N. Y.)

Photographs by Joel Feder, New York



A Massachusetts junk dealer recently effected a quick bargain which netted him a considerable sum. He was standing on a street corner when a passing au-



tomobile reared and struck a telegraph pole, throwing the two occupants to the pavement. Seeing that the driver when he righted himself was in anything but a friendly frame of mind toward his car, the junk dealer proffered \$15 for it. The offer was quickly accepted.

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Connecticut, famous as the "wooden nutmeg" state, from which has emanated many animal "stories," is now sponsor for a porcupine tale that, in taxing one's credulity, eclipses all its predecessors. Porcupines, as the story goes, are making life miserable for motorists on the roads in that state by shooting their quills into the tires of passing automobiles.



A farmer was recently fined \$20 for bumping his team into an automobile in Charlestown, Mass. The court imposed the fine to discourage the practise among drivers of horse vehicles of intentionally bumping into automobiles without cause.

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Automobile pirates have become so bold in Fall River, Mass., that the press of that city has called special attention to their activities and suggests a more rigid police attention to their depredations. They prey mainly upon abandoned machines which have become temporarily disqualified, and while the owner is in search of a machine to tow him home or to secure some necessary part, they strip the car of everything that can be carried off and often the car itself.



Signs are being placed at all intersections of roads leading into Terra Haute, Ind., by the Automobile club of that city. A large white arrow on a black background bearing the words, "Terra Haute," points in the direction of the city. These signs are placed at points on roads 25 miles from the city.

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The practise of sending children to public schools in limousines, sedans and other high class automobiles, accompanied by liveried servants, has called for severe criticism on the part of the president of the Chicago board of education. He says: "You should see it on



a rainy day. At closing time the automobiles are lined up there as if it were a fashionable reception with liveried chauffeurs to take the wrist watch boys home."

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Continued fatalities at railroad crossings have almost lead railroad officials and road authorities to give up their attempt to erect warnings at these approaches to save the motorist from himself. One genius, however, has come to their rescue. His device administers a severe shaking and jouncing to the occupants of the car that they cannot fail to apprehend the danger that confronts them. He accomplishes this by placing a series of artificial "thank-you-mams" on



either side of the crossing. These are of a sufficiently pronounced character to almost eject the driver from the car if he crosses them at high speed. It seems like a rather severe remedy, but as all previous devices were ignored, a radical method had to be adopted.

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The route selected for the Puget sound to Gulf highway will run through Austin, Tex., to Houston, instead of San Antonio and Corpus Christi, as was proposed in the original plan.

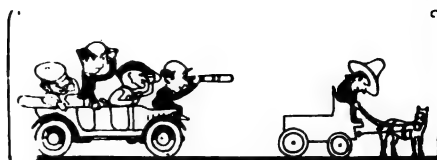
A boy on roller skates proved the Nemesis of an escaping autoist in Brookline, Mass., the other day when the driver of the car following an accident had put



on speed to escape the consequences. The boy went after him on his skates and succeeded in getting the number of the machine, which he turned over to the police, who apprehended the owner.

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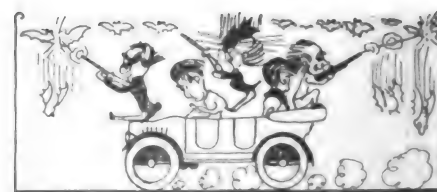
It is expected that at the next meeting of the Legislature in the State of Vermont, a bill will be passed requiring all kinds of vehicles to carry some sort of a light at night while on the roads. In the past there have been a number of cases where these vehicles without lights have been struck by motorists and the result was a suit against the owner of the car despite the fact that the responsibility lay largely with the owner of the wagon or team which was traveling along

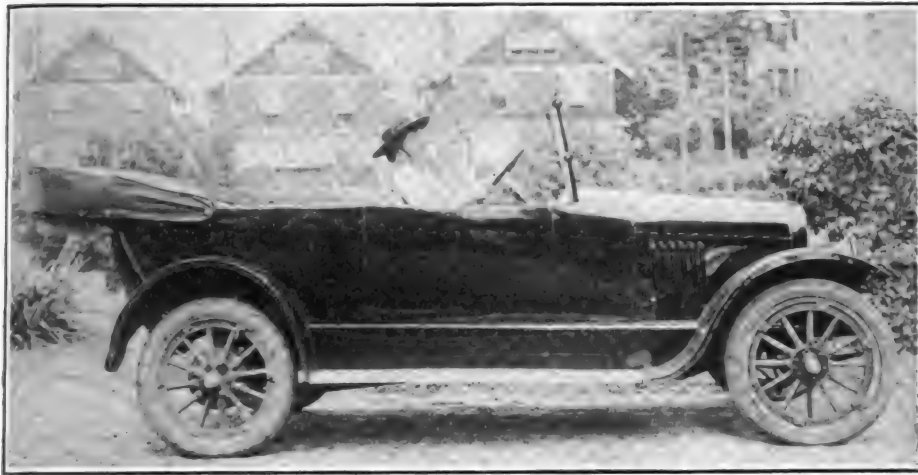


the road sometimes on the wrong side and quite often in the centre where other vehicles could not pass.

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The enthusiastic wing shot will read with envy of the recent "flying fox hunt" in Australia which was conducted from Overland automobiles, making the shooting even more difficult and requiring an expert eye and trigger finger. The flying foxes, which are really a specie of large bat, became a pest in one section of the big island empire and to exterminate them an automobile expedition of hunters was organized. There was no scarcity of game, tens of thousands falling before the hunt ceased.





The Enger 1917 Six-Twelve Touring Model.

The Enger Convertible Twelve Model.

Slight Shift of a Lever Instantly Converts the Twelve-Cylinder Engine Into a Light Six.

IN THE new Enger convertible twelve for 1917 a purchaser has at his command either a small economical six-cylinder engine for ordinary driving or a powerful 12-cylinder when power is needed. The power plant of this model includes a standard 12-cylinder valve-in-head motor, with aluminum pistons. By a slight shift of a lever six of the cylinders are thrown out of operation, leaving the other six to function as would a standard six-cylinder engine.

The advantages claimed for this engine is that with the 12 cylinders one always has the power and luxury of that type of motor and also has at command a light economical six-cylinder motor. By actual test the Enger for 1917 has accelerated from stationary to 25 miles per hour in five seconds. It provides a flexible range of from one to 60 miles per hour on high gear, and for ordinary running, by use of the economy lever, as it is called, can be made to obtain 25 to 35 miles to the gallon of gasoline.

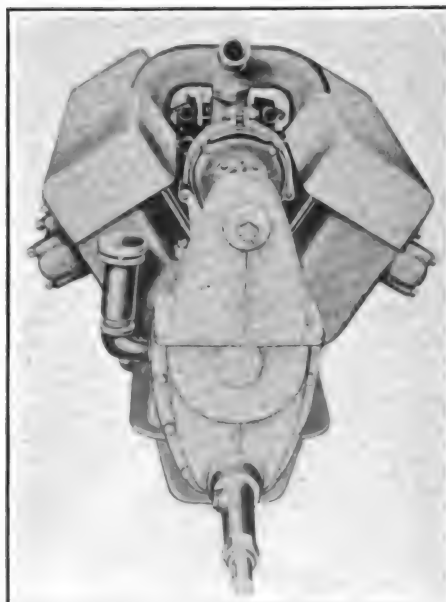
The principle involved in making the change is quite simple. The device consists of a cam shaft located in the steering column that when pushed in a certain direction holds open the exhaust valves of one of the cylinder blocks and simultaneously closes a shutter that prevents one side of the motor from receiving gas and relieves compression. The pistons on the side not in use are allowed to reciprocate as usual.

The engine is an Enger make with 2¾ by 3½ inches, developing by the S. A. E. rating 27.07 horsepower. The piston displacement is 186.04 cubic inches, the smallest of any 12-cylinder motor now made. The cylinders are of semi-steel and the pistons of aluminum. Noiseless ball and adjustable push rods work in ball socketed rocker arms with felt oil retainers. The maximum motor speed is 3000 revolutions per minute, for which

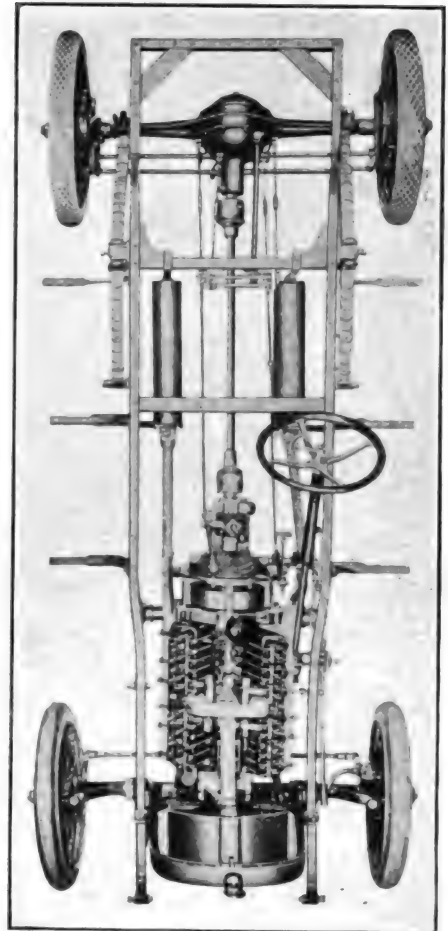
the maker claims a horsepower rate of 55. The crankshaft is carried on three main bearings which have bronze backed bushings and unusually large surfaces.

In the gasoline system there is the latest type, automatic float, Stromberg carburetor. It is located in the V valley and fuel is fed to it by gravity from a tank in the cowl.

The electrical system embraces the improved Remy Ignition, jump spark type and a two-unit Westinghouse starting and lighting installation, complete with combination ammeter and switch on the instrument board. In the lighting system there are new style double bulb electric headlights, which are controlled from the driver's seat.



The Enger Engine Is Fully Protected Against Mud, Dirt, Etc.



Strength Is Evident in This View of the Stripped Chassis.

Pump lubrication is used, the oil being forced through a hollow crankshaft to the connecting rod bearings. This pump is located at the bottom of the oil pan, which differs from standard reservoirs in that it has longitudinal tubes about which the air rushes and cools the oil.

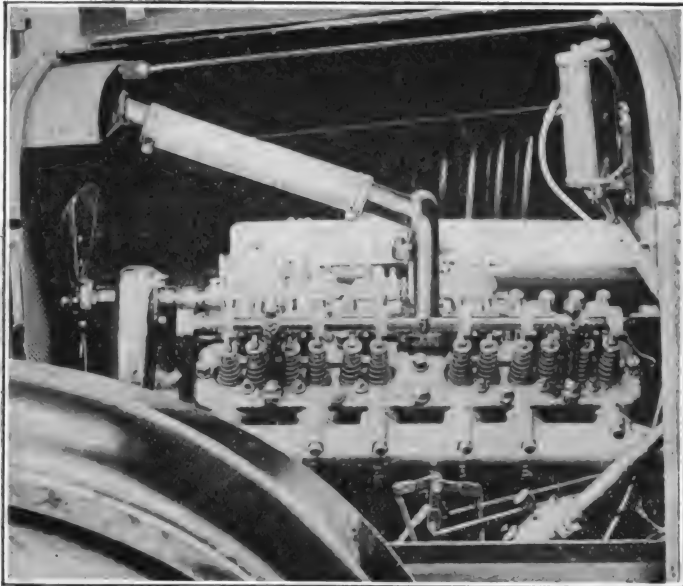
The clutch is of the dry plate multiple disc type, faced with Raybestos, and this component and the gearset run on double annular ball bearings, except the counter gears, which operate on bronze bearings.

The transmission gearset is of the selective three-speed design, with heat-treated nickel steel transmission gears. The drive is direct to spiral bevel gears in the rear axle through a nickel steel heat-treated propeller shaft and two universal joints.

The brakes are internal expanding and external contracting on ample sized drums and are provided with means for adjusting to compensate wear.

The rear axle is a full floating type with double row bearings throughout. The spiral driving pinion and the ring gear with which it engages are specially cut to insure unusually smooth action and reduction of friction. The front axle is a drop forged I beam section with integral yokes, drop forged tie rod ends and steering spindles, all double heat treated. The front wheels have extra large cup and cone ball bearings.

The rear wheels are of the wood artillery type, with demountable rims, extra large hub flanges, 12 heavy spokes



The Left Hand Side of the Engine, Showing Detachable Head of the Left Cylinder Block Removed.

and carry 32 by four non-skid tires; plain tires on the front.

The wheelbase is 116 inches, and the tread the standard 56 inches.

The semi-irreversible steering gear is of the split nut and worm type, fully adjustable, with one-piece housing. The steering wheel measures 18 inches and has an inserted spider, with the electric horn in the centre.

Control instruments include friction retained spark and throttle levers on top of the steering wheel, independent foot accelerator and muffler cut-out pedals for each six-cylinder block, foot push button for starter, pedal for service brake and clutch, with levers for gear changes and the emergency brake conveniently placed in the centre.

Only one chassis is being built and this, a five-passenger touring type, with streamline body, in which square corners are noticeably absent, sells for \$1295. This price represents an advance of \$200 over the price of last year, but is justified by the many refinements and improvements that have been incorporated in the new model. Much improvement in riding qualities have been obtained by the use of Enger special full-floating cantilever springs at the rear. The front springs are semi-elliptics.

Standard equipment includes motor driven horn, speedometer, robe rail, foot rest, one demountable rim and carrier, one-man top and Jiffy curtains, slanted rain vision ventilating windshield and the usual full equipment of tools, etc.

DOBLE CARS AT SHOW.

The General Engineering Company of Detroit, manufacturers of the new steam car which embodies the Doble steam power plant, will exhibit five of the cars at the New York Automobile Show in January.

A description of the new Doble cars was recently published in The Automobile Journal. They possess many fea-

tures never before employed successfully in the construction of an automobile and have a wide radius of operation on one loading of water and kerosene; have extreme flexibility of control and great speed.

The fact that the Doble power plant is a refinement and development of standard steam practise as applied to automobiles, has led a number of people to inquire as to the extent that Mr. Doble's inventions can be covered by patents. In answering these inquiries he says:

"The patents cover all laboratory and experimental work done in the last five years, and all the patent work has been and is being taken care of by legal firms of the highest standing.

"The fact that we are actually building cars and will shortly begin to market them is a very strong additional protection. A large number of engineers are constantly at work perfecting our power plant and adapting it for large production.

ALLEN ON MT. RAINIER.

R. S. Flack of Portland, Ore., on a trip through the mountains of Washington, which he made in an Allen model "37" touring car, ascended Mt. Rainier to a point 5400 feet above sea level. This level is above the snow line and the route is over a treacherous and difficult trail. A total of over 1000 miles was

covered on the entire trip with a cost of only \$8.50 for fuel and lubricants. The snow drifts at times almost made the roads impassable.

BRAKE LINING RENEWALS.

The General Asbestos and Rubber Company of Charleston, S. C., makers of Garco brand of brake lining, have issued an interesting and valuable booklet for motorists entitled, "Efficient Methods in Making Brake Lining Renewals." The methods of carrying out this repair or replacement are described in plain language and a number of illustrations are used to make the process clear to the reader. Instruction given by the book would seem to be ample to enable anyone in replacing the brake lining on his car.

SCRIPPS-BOOTH "TOUR."

The Scripps-Booth company has issued a very novel folder in the form of an invitation to join in the "Scripps-Booth season's motoring tour up and down America." Three pages are devoted to an interesting consideration of reasons why the tour should be taken by every motorist and on the last page is a return card to be filled out and addressed to Scripps-Booth dealers, requesting a demonstration.

PENNSYLVANIA SECTION S. A. E.

The Pennsylvania Section S. A. E. will hold its first meeting of the 1916-17 season at the Engineer's Club, 1317 Spruce street, Philadelphia, on Thursday evening, Oct. 26, at 8 o'clock.

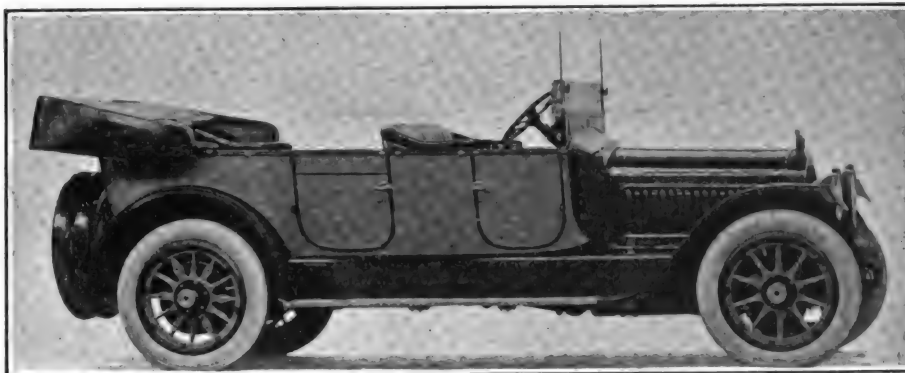
Herbert Chase, chief engineer of the Electrical Testing Laboratories of the Automobile Club of America, and treasurer of the S. A. E., will read a paper on "The Otto Cycle Versus Constant Pressure Cycle for Automobile Engines."



The Allen That Made a Record Run in Washington as It Entered Mt. Rainier Park.

PACKARD 1917 TWIN-SIX IS REFINED AND BUILT LOWER.

Two Twin-Six Models, "2-25" and "2-35," Are Offered for 1917.



Model "2-25" Has Chassis 126½" Long; "2-35" Is 125" Long.

BECAUSE nearly 8000 car owners have found the Packard Twin-Six eminently satisfactory in every respect, the Packard Motor Car Company in making up its 1917 line of models has not found it necessary to make any radical changes in the model. Such changes as have been made relate to higher degrees of refinement and comfort for passengers and drivers.

While the 12-cylinder engine when brought out by the Packard company a year ago was regarded by many as a radical departure from conventional practise, it was in reality a logical step in Packard development. It was based on the idea of splitting larger stresses into smaller ones, the basic principle on which rests the most important advance in motor car construction from its crude beginning in the two-cylinder car. The advantages claimed for the Packard Twin-Six are not only greater smoothness and less noise, but also greater power combined with reduced cost of operation and maintenance.

Cars Are Much Lower.

The model cars are built considerably lower than any previous Packards, the chassis alone being approximately two inches lower. This has been achieved by adopting 35 by five-inch tires on all four wheels, by flattening the rear springs and by lowering the front axle spring pad, thus bringing the running boards to within 16 inches of the ground. The lower construction improves the appearance of the cars and makes them more compact. The bodies remain roomy and comfortable.

The larger Packard car, the "2-35," is continued with a wheelbase of 135 inches, but the wheelbase of the "2-25" has been increased 1½ inches and is now 126½ inches. In each case the numeral "2" refers to the second series of the Twin-Six line.

As has always been the case with the Packard company, special attention has been given to the bodies. There is an entirely new

The New Packard Is More Compact and Lower.

body, a very neat four-passenger runabout, which has individual front seats, with a passage way between, so that two persons may be seated comfortably in the cozy rear compartment.

A new type of upholstery springs is used, making it possible to lower all

ies, excepting the "2-35" salon touring, and in all six-passenger enclosed bodies, the folding seats are of the forward disappearing type.

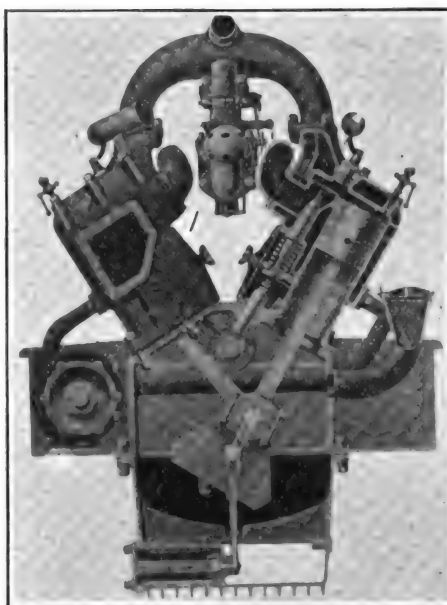
Probably the most noteworthy change from the mechanical point of view is the water circulation system. In place of the water being expelled from the forward ends of the cylinder blocks, as is customary with V type motors, the gas intake manifold has been cored out to permit all water from the cylinder jackets to be circulated through this manifold and thence to the radiator through a single tube in the centre. This arrangement not only eliminates the use of considerable tubing, but causes the water to surround the gas intake header while at the highest temperature and to greatly assist in vaporization.

New Location for Thermostat.

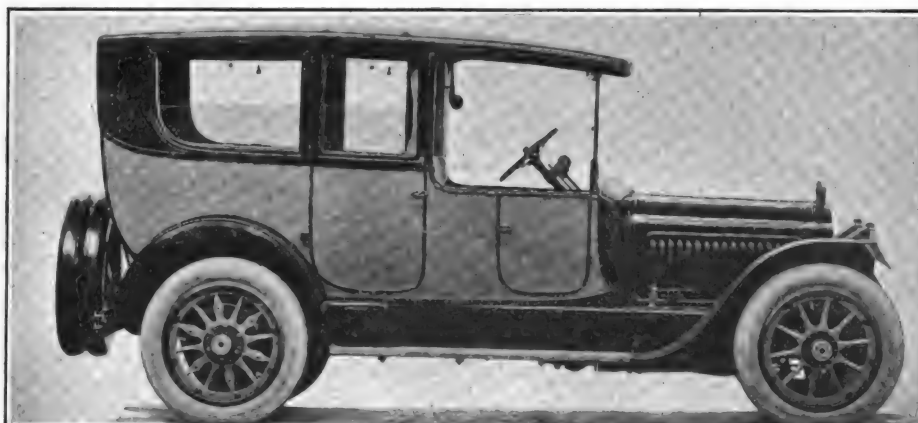
The thermostat is now placed in the upper tank of the radiator, instead of on the water pump, so that the thermostat by-pass now connects the radiator inlet and outlet tubes, preventing circulation through the radiator until the water has reached the proper temperature for efficient operation.

The motor is simpler in design, yet unchanged in general construction. The three by five-inch cylinders are cast in two blocks of six and placed at an angle of 60 degrees, and slightly offset, so that the connecting rods from opposite cylinders are attached side by side on the same crank pin of a six-cylinder crankshaft. The cylinder heads have been made detachable. The generator has been improved internally and runs faster than in last year's model.

The interrupter cam in the Delco timer and distributor unit has been redesigned to decrease the current consumption and induction coils have been removed from the



An Unusual View of the Packard Twin-Six Engine.



Fenders Curved to Conform to the Wheels Make the New Packard a Better Appearing Car, While Improved Mechanism Adds to Its Efficiency.

forward ends of the cylinder blocks and placed on a common bracket attached to the left forward crank case arm, while all wiring between coils and distributor is now carried in a metal tube.

The tension of the foot brake pedal retracting springs has been decreased. The change speed lever has been redesigned to give more clearance and is now equipped with a ball end.

The chassis frame has been made $7\frac{1}{2}$ inches deep, instead of six inches, and is reinforced over the rear axle, which design tends to eliminate the possibility of body distortion.

The standard tire equipment on all Packard cars will be Goodyear Cord, 35 by five, on all four wheels. On the front wheels there will be rib tread tires and the rear all-weather tread. Kelly-Springfield and Goodyear fabric tires are optional with the purchaser.

The prices of the Packard models for 1917 have been slightly advanced, as is shown in the accompanying table. This increase represents the advanced cost of high grade materials.

THE "2-25."

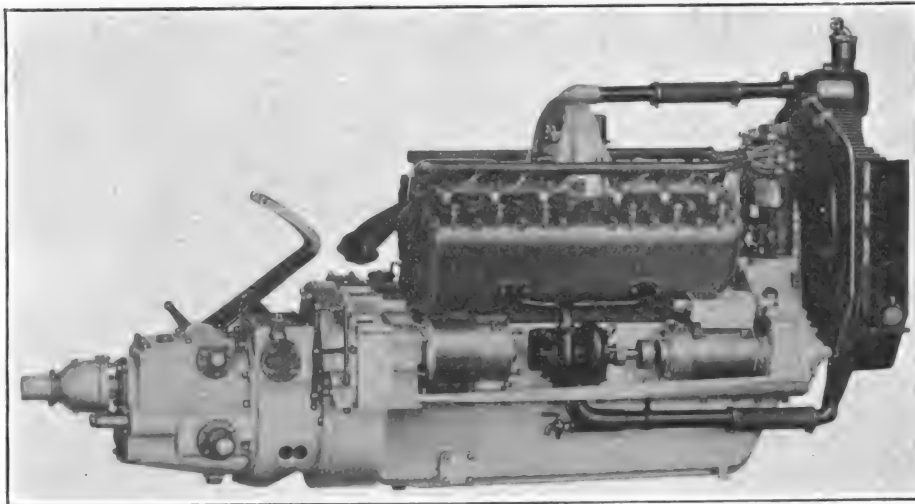
Seven-passenger standard touring car	\$2865
Five-passenger phaeton.....	2865
Five-passenger salon phaeton.....	2865
Four-passenger runabout.....	2865
Two-passenger runabout.....	2865
Chassis	2465
Three-passenger coupe.....	3965
Six-passenger limousine.....	4265
Six-passenger landaulet.....	4315
Four-passenger brougham.....	4315

THE "2-35."

Seven-passenger standard touring car	\$3265
Seven-passenger salon touring car	3265
Five-passenger phaeton.....	3265
Five-passenger salon phaeton.....	3265
Chassis	2765
Seven-passenger limousine.....	4715
Seven-passenger limousine, cab sides	4765
Seven-passenger imperial limousine	4915
Seven-passenger landaulet.....	4765
Seven-passenger landaulet, cab sides	4815
Six-passenger limousine.....	4665
Six-passenger landaulet.....	4715
Four-passenger brougham.....	4715

The features of Packard mechanism stated briefly are as follows:

The Twin-Six motor is of the V type, with integral gas intake header and water outlet header; piston displacement is 424 inches and pistons are fitted with Burd high compression rings; single cam shaft has separate cams for each valve lift; all valves are enclosed; cam shaft and generator are shaft driven from crankshaft by silent chain, with special



The Unit Twin-Six Power Plant of the 1917 Packard.

provision for easy adjustment and lubrication.

The cooling system is the positive water circulated type, with separate impeller for each cylinder block, and the radiator is the vertical ribbon type, flexibly mounted in trunnion seats.

Lubrication is pressure feed by gear pump, pressure being automatically

regulated for different power requirements. Oil is conveyed under pressure to all bearings in the crank case and fed to cylinder walls by overflow from piston pin bearings and by spray from connecting rod lower end bearings.

Packard-Delco ignition is used, the current being supplied by generator, with storage battery floating in line. There is an automatic spark advance for normal running and a supplementary hand control for extreme conditions.

Starting and lighting is by a Packard-Bijur two-unit installation, the starting motor operating only when cranking engine. The electrical output of the generator is controlled by automatic regulator.

The gasoline system includes a special Packard carburetor design, mounted high above and between the cylinder blocks, with automatic adjustment. The intake manifold is entirely hot water jacketed. Fuel is fed by motor driven air pump, the gasoline tank being carried at the rear of the car.

Packard Clutch with Brake.

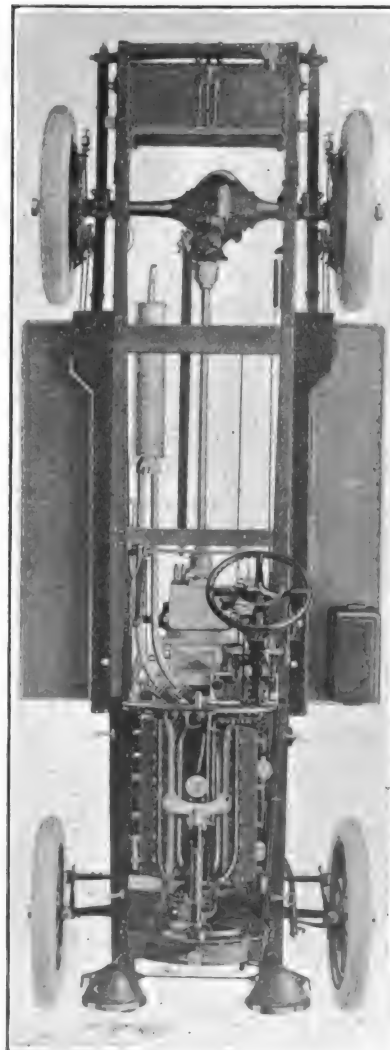
The clutch is a Packard dry plate type, and is provided with an easily adjusted brake. The transmission gearset is in unit with the motor and clutch, and is of the three-speed selective type, the gears being held in mesh automatically at any speed by gear interlock.

The rear axle construction includes a pressed steel housing with nickel steel reinforcing tubes enclosing live axle shafts. Worm bevel gears give silent rear axle reduction. There is a torque arm mounted to right of the driving shaft to oppose torque reaction of the motor.

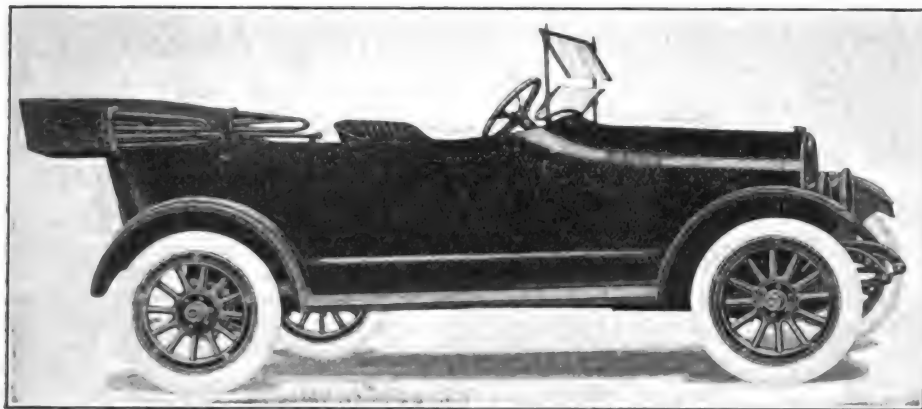
The brakes are internal and external types, acting on 17-inch drums on rear wheels. The foot brake leverage is changeable to suit varying braking surface and driving conditions, there being three combinations possible.

The wheels are a selected second growth straight grain hickory, the hub cores and wheel flanges being one-piece drop forgings. The front springs are semi-elliptic with tension shackle at rear end. The rear set are of the three-unit type, with a cross spring 40 inches long.

The standard equipment includes a Packard one-man top, curtains according to body style; storm-tilt Packard windshield, on all open cars, with large adjustable ventilator in windshield filler board; Sparton horn; Waltham speedometer and clock; complete tool kit; complete set of extra lamp bulbs, fuses and battery syringe; two extra demountable rims; an improved tire carrier and a tire pump.



View of the Stripped Packard Chassis.



Much Care Has Been Taken to Make the Body Lines of the 1917 Dort Distinctive and Striking.

THE makers of the Dort car, the Dort Motor Car Company, Flint, Mich., have been building vehicles for 30 years and the organization today is one of the strongest in the automobile industry. The car is always well spoken of among car owners, principally because of its very neat external appearance and its efficient mechanism. Of course the price of \$695 has its own appeal.

Seldom does one find among motor cars in the price class under \$1000 one having so many high grade features, chief among which are the combined clutch-and-brake, doing away with the emergency brake, the two-blade aeroplane fan, the independent cooling of the cylinders, the double exhaust system by means of which power is increased by 12 per cent. in actual test, and other features usually associated with the higher priced cars.

The Dort line for 1917 consists of a five-passenger, four-cylinder touring car and the three-passenger Fleur-de-lys roadster, both bodies being mounted on the same chassis. The wheelbase of the car is 105 inches and the road weight of the touring car is 2100 pounds.

The four-cylinder, L head engine is of Dort make. The cylinders are cast en bloc and the bore and stroke is $3\frac{1}{4}$ inches by five inches. The engine develops 28 horsepower at 1600 revolutions per minute and 33 at 1900 revolutions per minute. It is in unit with the clutch and transmission and no moving parts, except the fan, are exposed. The valves are enclosed and interchangeable and are actuated by mushroom lifters. The timing gears are helical and the camshaft is carried on three bearings. The crank shaft is of the two-bearing type, these bearings being of babbitt die cast and of liberal size.

In the carburetion system there is a Carter F. O. instrument, it receiving the fuel by gravity from a tank in the cowl. Ignition is by battery system, using a Connecticut distributor with automatic switch.

In the Dort thermo-syphon cooling system the water circulates in exceptionally large jackets around the "flame area" of each cylinder and completely around each valve cage. The radiator is of the fin and tube type and has capacity for three gallons. Another feature of Dort

engine construction is the double exhaust. The pipe being divided by an internal partition, subsequent cylinders exhaust into alternate sections of the pipe. In this way the length of time allowed for the gas to pass from the cylinder is doubled, with the consequent elimination of possible back pressure and increase of power.

Lubrication is by the constant circulating splash system. The pump is driven by an eccentric from the cam shaft and the oil is splashed by the connecting rod scoops to every interior bearing of the engine.

The electrical installation is Westinghouse make and is built into every Dort motor as an integral part. It is the latest two-unit type, the power from the starting motor to the flywheel being applied by Bendix drive. The six volts lighting generator is supplied with a voltage regulator to control the amount of charging current for all battery conditions.

The clutch is a leather faced cone with six compensating springs, and the transmission gearset of the three-speed selective type, the main shaft running on New Departure double row ball bearings.

The drive is through one universal joint on a chrome nickel steel propeller shaft to the three-quarter floating Walker-Weiss rear axle. Hyatt high duty roller bearings are used in the differential and the wheels. Torsion is taken by

Two Models Offered by Dort for 1917 Season.

a forked torque tube. The brakes are of the internal expanding and the external contracting type and are lined with Autobestos.

The springs are Ansted make, the rear set being full cantilever and lubricated by grease cups. The front set are half elliptics, and the front axle an I beam section with cup and cone bearings in the wheels.

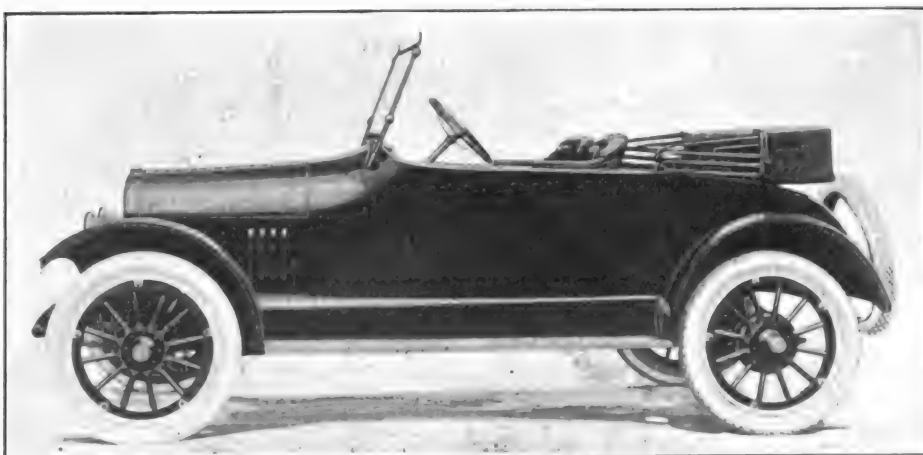
The wheels are second growth hickory with Perlman rims carrying 30 by $3\frac{1}{2}$ Goodyear tires, non-skid on the rear. The steering gear is the irreversible, worm and nut type, of Jacox make. In the centre of the 16-inch wheel is the horn button.

The driver's compartment is notable for its absence of cluttering control levers. Shifting is done by a single lever, while the clutch pedal is used for the dual purpose of disengaging the clutch and applying the service brake.

THE FUTURE AUTOMOBILE.

The address delivered by C. F. Kettering of the Dayton Electric Laboratories Company, at the annual meeting of the Society of Automobile Engineers last summer, has been printed in the form of a pamphlet, which is entitled "Science and the Future Automobile."

Mr. Kettering's address was one of the big features of the cruise and was not only highly instructive, but also entertaining, as he made many demonstrations with elements that are not handled to any great extent by the majority of men engaged in the auto industry. The experiments he employed were of a highly spectacular character.



The Three-Passenger Fleur-de-lys Roadster.



Society Maids and in 1917 Motor St. Louis Veiled

Miss Nellie Tracy (At the Left) Winner of the First Prize, in an Apperson Roadster. One of the Most Popular of the Younger St. Louis Society Set, Miss Tracy Received a Great Ovation.

Mrs. Harry Vinsonhaler (Directly Below) in the Marmon in Which She Participated in the Automobile Fashion Show.

At the Bottom of the Page is Shown Miss Sarah Edwards at the Wheel of a Winton Six. Miss Edwards, Star of the Park Opera Company, St. Louis, Had a Large Following, but Failed to Win a Prize.

A NEW idea in displaying late models of motor cars was staged at Maxwellton Park in St. Louis during the second week of this month, in connection with the Veiled Prophet Pageant. The display consisted of having leading members of St. Louis society parade around the park's track in their best cars and best clothes. The event had its business aspect, too, it giving the St. Louis car dealers the opportunity to exhibit their latest and best models before the prominent as well as the less known people as they gathered in the park in festive mood.

The show was the second of its kind held in this country, and was gotten up by Clarence Bennett, who recently staged a similar exhibition in Los Angeles. The advisory board was made up of society matrons, the chairman being Mrs. Lon O. Hocker and the vice chairman, Mrs. Charles Cummings Collins. Virtually all the well known makes were exhibited,



their prices ranging from \$345 to foreign cars costing approximately \$10,000.

The outpouring of spectators testified to the drawing power of the fashion show. The grandstand was thronged long before the head of the parade, which had traversed main thoroughfares of the city, appeared in the grounds. The cars and their occupants were announced as they appeared and each then made a turn around the judges, following this with a lap around the race track and lining up again in front of the club house.

The judges were distinguished foreign and American diplomats, business and society men. Among the consuls and foreign visitors acting as judges were Jose Alvarez of Spain, Sir James Arbuckle of South America, Alessandro Broletti of Italy, Augusta Aguiler of Cuba, Marc Seguin of France and Dr. Otto von Hubicki of Austria and Germany, while Frank W. Taylor, Jr., of St. Louis, and C. E. West of Colorado Springs, Col., represented the United States.

The determining of the awards rested partly with the judgment of the award jury and with the spectators. The lat-

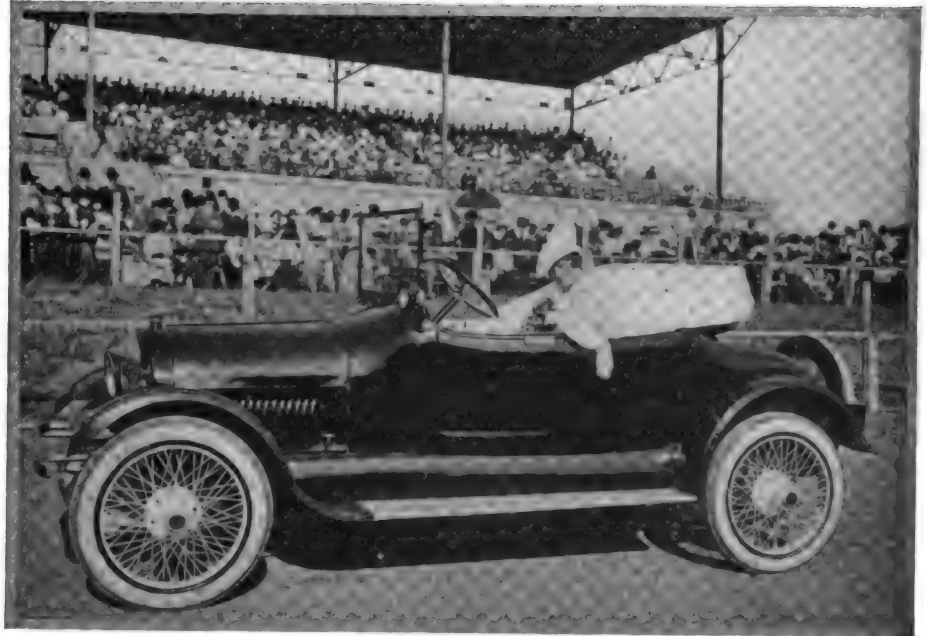


Matrons on Parade Cars at the Prophet Pageant.

Miss Margaret Cockrell (At the Right) in a Reo Roadster. Though Not a Prize Winner, She Attracted Much Attention Because of Her Striking Costume.

Miss July Collins (Directly Below, First on Right), Winner of Sixth Place, in Her Pathfinder. In the Detroit Electric is Mrs. Lon Hocker, Winner of Fifth Prize and Chairman of the Parade Committee.

At the Bottom of the Page is Shown Mrs. Charles Cummings Collins, Leader of St. Louis Society, in Her Packard Town Car. Mrs. Collins Withdrew to Allow Her Daughter to Win Sixth Prize.



Kruger, in a MacFarlan, took fourth.

Mrs. Lon O. Hocker, chairman of the fashion show committee, drove a Detroit electric and was awarded fifth prize. Her costume was an afternoon creation in pink. Miss July Collins, who drove a blue Pathfinder, took sixth place, largely through the generosity of her mother, Mrs. Charles Cummings Collins, who withdrew her entry, though one of the chosen 12. Mrs. E. N. Nims, who was accounted the best dressed contestant, secured the seventh prize. She was in a Hudson green town car, driven by a liveried chauffeur. Her gown was of red velvet with hat and furs to match. Eighth prize was awarded to Mrs. J. J. McAuliffe, in a buff colored Winton.

In the parade preceding the selection of prize winners were a Lancia, gray Stutz Bulldog roadsters, red roadsters of the same make, Scripps-Booths, Chandlers, Westcott touring cars, Locomobiles, National Highway Twelves, Franklins, Buick roadsters, Jefferys and Overlands.

ter were requested to voice their votes as loudly as possible as an American flag was held over each contestant.

Fifty-six contestants, gowned in the latest fashion and driving cars that were groomed until they shone brilliantly in the sun, appeared for the competition. By a process of elimination by acclamation the number was reduced to a selection of 12 of the most striking cars and drivers. Of these the contest narrowed down to eight, each of whom was awarded a prize.

The first prize went to Miss Nellie Tracy, a petite and very popular member of St. Louis' most select society. She drove an olive green Apperson roadster, and was clad in a costume of red and white, with a felt hat around which was wound a red ribbon. The prize was a \$300 diamond bracelet.

Second was accorded to Mrs. Julius S. Walsh, Jr., who drove a black Packard and was dressed in a black suit, white hat and furs. The prize was a diamond la valiere. Third went to Mrs. French Nelson, whose Jordan car was driven by a liveried chauffeur. Miss Marie C.



Myle-Maker Tested By A. A. A.

Fuel Economizer Mounted on Stock Ford Shows an Increase of 18.22 Per Cent In Mileage.

An exceedingly thorough test of the Myle-Maker, the new fuel economizing device produced by the Myle-Maker

first test with the Myle-Maker attached.

The A. A. A. technical expert, F. F. Ed-



Ford Car Used in Myle-Maker Test, with F. E. Edwards of the A. A. A. in Front and Leroy Hillman of the Chicago Automobile Club in Rear.

Company of Chicago, was recently staged in that city by the Automobile Association of America and the Myle-Maker easily maintained its reputation, even though the test was extraordinarily rigid.

The device was tried out on a 1917 Ford car that had been run but 278 miles and had been picked at random. The car was standard in every respect. The Stewart speedometer which was to register the mileage had been thoroughly overhauled by the makers and put into first class operating condition. The Holley carburetor was likewise overhauled. Knowing that the car was to be put to a gruelling test to show mileage the carburetor expert adjusted the instrument to produce a far thinner mixture than used ordinarily by the driver of a Ford.

Details of Test.

The car was first tried without the Myle-Maker and showed a mileage of 22½ miles per gallon. In making this test the motor was run until it died out through exhaustion of the gasoline in the standard tank. A measured U. S. gallon of gasoline was then poured into a special tank, and the car started with the aforementioned result.

One hour later the same car, which weighed complete with passenger load 2267 pounds, was equipped with the Myle-Maker and sent from the same starting point, over the same course and under the same climatic conditions. It required only one minute and 20 seconds to make the attachment. Before the start the needle valve was turned down still further, three-eighths of a turn, making the mixture even finer than in the

wards, watched the driver to see that he maintained the same average speed as in the first trial. The result was that the Myle-Maker easily proved the claims made for its manufacturers, it showing a mileage record of 26.6 to the gallon, an increase of 18.22 per cent. over the mileage made by the car without the Myle-Maker attached.

Myle-Maker Acceleration Test.

A test was made of the comparative

acceleration of the car without and with the Myle-Maker attached. Without the Myle-Maker the speed was increased from 7½ miles to 30 in 24 seconds. With the Myle-Maker the same increase was made in 22 seconds.

HAYNES AWARDS CAR.

The Haynes Automobile Company of Kokomo, Ind., has awarded a "Light Twelve" to Edward J. Howard of Jeffersonville, Ind., under the terms of the "Haynes Old Car Test," which was announced several months ago. Mr. Howard becomes the recipient of the new Haynes car by virtue of the fact that he has in his possession the oldest car in America.

It is an old gear driven Haynes which he bought from the factory in the summer of 1897. He has had the car in his possession ever since and although it has been used for 19 years, it is still in running condition.

There were 140 entries for the prize. Walter E. Smith of Bound Brook, N. J., was found to be in possession of the second oldest car and two other old two-cylinder Haynes built before 1900 were located, one at Newport, R. I., and one at Torrington, Conn., the former in the possession of H. P. Horton and the latter the property of E. G. Perkins. These cars, however, had chain drives and mechanically operated valves, which stamped them as later types than Mr. Howard's car.

Mr. Howard's car is in very good condition considering the years of service it has given, although it has never been repainted, and no mechanical changes have been made in it of a radical character. The original upholstery is intact. The new car was to be presented to the winner on Good Roads Day at the Indiana Centennial Celebration at Indianapolis on Oct. 12.

COMING EVENTS

October.

Show, Los Angeles, Cal....Oct. 28-Nov. 4

November.

Show, Texarkana, Tex.....Nov. 7-11
Show, Providence, R. I.....Nov. 10-18
Race, Santa Monica, Cal., Vanderbilt

Cup and Grand Prize..Nov. 16 and 18
Race (Track), Phoenix, Ariz....Nov. 18
Race (Speedway), Los Angeles..Nov. 30

December.

Show, Springfield, Mass.....Dec. 2-9
Celebration, National Electrical DisplayDec. 2-9
Race (Speedway), Los Angeles..Dec. 25

Show, Cleveland, O.....Dec. 30-Jan. 6

January.

Show, New York City.....Jan. 6-13
Convention, S. A. E., Mid-Winter Meeting at New York City.....Jan. 9-11

Show, Montreal, Que.....Jan. 13-20
Show, Cleveland, O.....Jan. 13-20
Show, Buffalo, N. Y.....Jan. 22-27
Show, Chicago.....Jan. 27-Feb. 3

February.

Show, Minneapolis, Minn.....Feb. 3-10
Show, San Francisco.....Feb. 10-18
Show, St. Louis.....Feb. 18-25
Show, Omaha, Neb....Feb. 26-March 3
Show, Newark, N. J.....Feb.
Show, St. Louis, Mo.....Feb.

March.

Show, Boston, Mass.....March 3-10
Show, Fort Dodge, Ia.....March 6-10

April.

Race (Road), Los Angeles to Salt Lake City.....April

SUGGESTIONS FOR THE FORD CAR OWNER.

Renewal of Worn Pinions and Gear of the Steering Post---Reassembling the Engine--- Relining the Transmission Bands--Restoring the Ignition System.

The 68th article dealing with the operation, construction, maintenance, care and repair of the model T Ford chassis is the 19th of the series devoted to adjusting, restoration and overhaul.

AFTER the machine has been driven for a long period there will be wear of the pinions and perhaps of the internal gear case of the steering column, which will be evidenced by the degree of backlash that will be found when the hand wheel is turned in either direction. This backlash is not a serious condition, but the driver will find that the wheels cannot be held steadily in one direction, there being a throw from side to side of the plane in which they should move, and this is extremely annoying and might in some circumstances where great care is necessary be a danger.

There is no manner of compensating this because of the reduction of the pinions and gear from wear and the only practical restoration is replacement of the pinions and perhaps the internal gear case. There may also be necessity of renewing the bushing in the upper end of the steering post that carries the short shaft on which the hand wheel is mounted. This bushing can be withdrawn and replaced with a new part. Should the wear be considerable the owner had best renew the worn pinions, gear case and bushing rather than take any chance. The cost will be trifling and with new parts the steering gear will be made practically as efficient as when first installed in the chassis.

Throttle and Ignition Levers.

The rods that control the ignition and fuel supply are respectively at the left and right sides of the steering post, being housed to the base flange of the steering column. They are mounted in substantial brackets at the head and foot of the assembly and at the upper ends carry levers that are extended straight to a quadrant on the rear side of the steering column, and are then bent so that there will be greater clearance for convenient handling. The quadrant is notched and the levers may be set into the notches so that they cannot be moved accidentally or swing when the hands are removed from them.

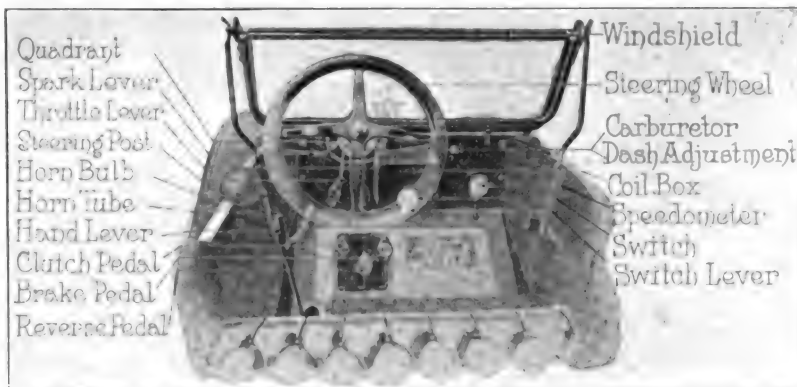
There is from the ends of these rods linkage of small rods with the carburetor and timer. There is no reason to expect material wear of

these, or at least such as would necessitate renewal of the parts under several years of service. The continued wear and the lost motion resulting from it will eventually impel attention, but the degree will be obvious to the driver.

While the work is being done on the chassis the muffler should be removed and taken apart and cleaned of the accumulation of products of combustion. The cleaning will probably have some noticeable effect, especially if the chambers are partially filled and their capacities somewhat reduced.

Reassembling the Engine.

When working on the chassis convenience will probably dictate the engine being replaced last of all, and following this assumption the reassembling of the power plant has been left until



The Steering Column, Footboard and Dash from the Driver's Seat, Showing the Location of the Different Control Members.

all other units had been dealt with. In reassembling the engine block and replacing it in the chassis care should be taken in setting the gaskets. The gaskets ought to be perfect and the machined edges of the parts ought to be cleaned thoroughly. This can be done by wiping with cloth wet with gasoline and the gaskets, if of paper, should be coated on either side with shellac and stuck on one edge, and the replacements should be made carefully so that the gaskets shall not be broken. Some repairers use heavy grease on parts that are not subjected to great heat with considerable success. The cylinder block head gasket is copper asbestos, as are the gaskets for the exhaust and intake manifolds and the water inlet and outlet manifolds. These do not require shellac or grease between them and the edges or flanges. When assembling parts in which gaskets are used the nuts should be turned down evenly on the studs or bolts and then tight-

ened uniformly so that all shall be well seated and there may be no possibility of leakage. It is best to turn each nut one revolution at a time throughout the series instead of seating one at a time and leaving the others loose.

Replacing the Transmission Bands.

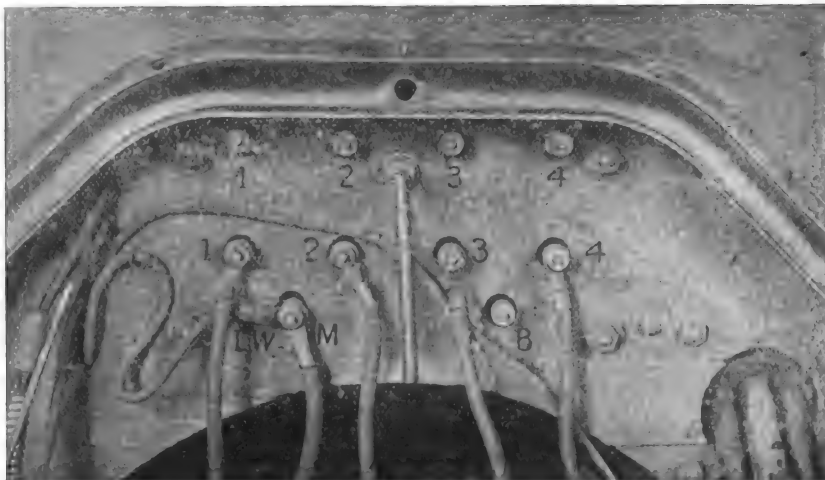
When the engine block has been installed in the chassis the transmission bands, so-called, must be replaced. These bands are pieces of spring steel with a lug or ear, in which there is a deep notch that practically forms a yoke at either end. These ears are each retained by three rivets. The bands should be examined to see that the ears are secure. If the rivets are loose they should be replaced with new. The linings of the bands, which are an impregnated fabric, will probably be found thin, and these should be removed and replaced with new. Lining can be bought that is cut to length and with rivets, so that taking off the worn lining and riveting on the new is a very simple matter. The ends of the rivets should be well peined to make a smooth job. The appear-

transmission clutch shift or collar on the shaft, by which the clutch spring is operated, and the ears of the bands engage with the pedal shafts with the springs on the shafts between the ears.

Adjusting the Band Clearance.

The forward shaft operates the reverse and the rear shaft the slow speed action of the gearset. On the right ends of these shafts, inside the cover, are the adjusting nuts. These were turned off as far as possible to release the bands when the engine was disassembled. The shaft for the slow speed pedal extends through the transmission cover and the adjusting nut is outside at the right. This was also slackened to remove the cover. When the cover has been bolted to the engine case the bands should be adjusted so that there is just clearance for them as the engine is turned, but the bands should not bind at any place.

The best result is obtained when the bands are free and do not restrict the movement of the drums, but when pressure is applied the pedals will engage easily. If there is much movement of the pedals in the event of quick action, which will often be necessary, the engagement will be harsh and will cause jolts. The degree of clearance can be noted and the movement of the pedals by the hands will give the setting of the nuts that will be best for satisfactory driving. When the reverse and brake bands have been adjusted the plate of the cover may be replaced and secured. The slow speed band can be adjusted without opening the transmission case. The transmission cover is shown with the brake band placed on the shaft, and the manner of adjusting the reverse and brake bands with a



Front of the Dash: Four Upper Terminals for Primary Connections from Coils to Timer; Four Lower Terminals for Secondary Wiring from Coils to Spark Plug; B and M Indicate Battery and Magneto Terminals, and LW the Connection of the Lighting Circuit with the Magneto Lead at the Coil Terminal Instead of Direct to the Contact on the Engine Case.

ance of the bands with new lining is illustrated.

The bands may be replaced before the engine block is set in the chassis or after this work is done, as may be convenient. If the gearset is not partly enclosed by the engine case the bands may be slipped over the drums from the rear of the gearset, but if in the engine case the bands may be spread and the ends dropped over the triple gears, after which the bands may be turned so that the ears are uppermost, when they can be drawn back over the drums. The bands can be dropped over the gears more easily if the flywheel is turned so that one set is slightly at the right of a perpendicular line through the centre. The paper gasket, or a new one, may then be placed on the edge of the engine case and the transmission cover can be put on, care being taken to have the transmission clutch release ring on the clutch shaft engage with the rear groove of the

wrench and trying the shafts for clearance are both illustrated.

Ignition System Efficiency.

When the engine is completely assembled and the manifolds connected, and the carburetor installed and connected, the condition of the ignition system must be determined. The magneto was tested before the assembly was begun and found to produce a spark through a circuit from the contact or terminal that was grounded on the engine block, and the clearance of the magnets and coils was found to be correct. The timer or commutator cap is retained by a flat spring, one end of which is secured to the case by a cap screw and the other end can be swung on or off the case. Upon swinging the commutator case spring the cover, which is seated around a circular web or rib, may be lifted.

The commutator case is aluminum and it is

machined inside to take a fiber ring that closely fits the inner periphery. Into this fiber ring are set four steel segments that do not contact with the metal of the case and have terminal posts that project through the ring and the walls of the case. These are seated and retained by nuts and on these posts are the thumb nuts that retain the terminals of the wiring from the coils.

The Commutator Arm or Brush.

The commutator arm is primarily a hub that has a single pointed segment on one side and diametrically opposed to it is a segment that is yoked parallel to the axis of the hub, and there is a pivot through the yoke ends on which is mounted the commutator arm proper, which has a yoke carrying a steel roller at one end, and the other end is drilled. There is a spring extending from it to the end of the single segment. The timer is mounted on the end of the camshaft, it being retained by a lock nut, inside of which is a circular steel brush cap. After drawing off the brush cap and driving out a pin the brush can be removed from the camshaft. In the accompanying illustration is shown the commutator case with the primary wires removed, the terminal ends of the primary wires, the commutator brush, the brush cap and the retaining pin. The construction of the commutator arm can be noted very clearly.

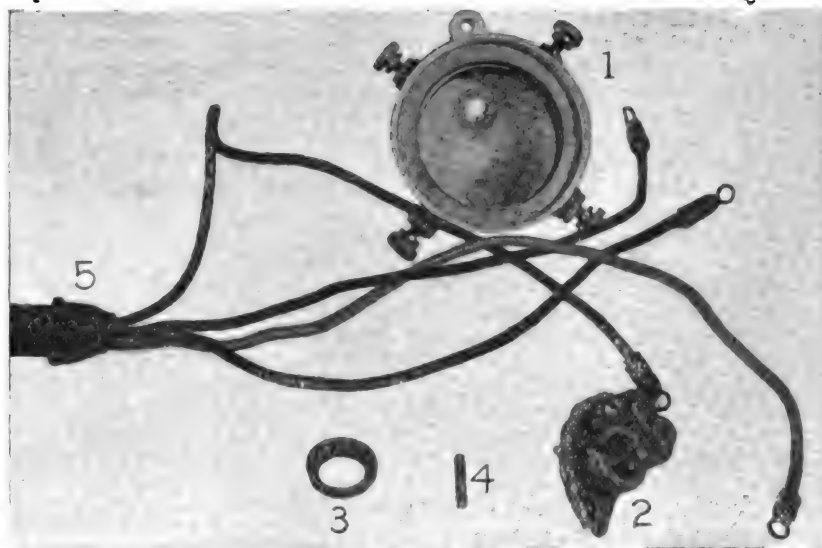
The principles of the ignition system have been very fully explained in previous installments, but a brief statement is desirable at this time. The magneto differs with other types in that it has a revolving field and stationary armature and as the fly-wheel carrying the field magnets revolves alternating current is induced in the coils of the armature as the north and south poles of the magnets pass them. This current is carried through the coil windings to the magneto contact that is mounted on and is insulated from the cover of the transmission gearset case, and the magneto contact by spring pressure is forced against the grounded end of the armature coils. From the magneto contact there is a wire that leads to the magneto terminal of the coil box.

Details of the Coil Box.

The coil box is fixed to the back of the dash with a space between the two of perhaps a quarter inch. If the coil box is a four-unit type there will be 10 terminals from it that will project through the dash and sufficiently to attach the wiring to them. In the coil box is a false bottom through which four contact discs rise. These discs are part of a contact unit that extends the length of the box, beneath which are springs that

lift the discs slightly above the false bottom, and this contact unit is connected with two terminal posts. These are the lowest pair of the 10 terminals projecting through the dash. On the back of the coil box are the two rows of four terminals each. The inner ends of these terminal posts have contact discs that are forced toward the inside of the box by springs. Thus one will understand that instead of solid connections that might be broken or obstructed, there are 10 contacts constantly maintained by springs.

With the four-unit coil box four separate coils are used, each of which has what is known as an armature or vibrator or trembler at the top. In the bottom of each coil is a circular brass contact point, and on the back side of each coil are two more, the relative positions of which may be judged from the illustrations, which will, when the coil units are placed side by side in the coil box, make contact with discs of the terminals. The units fit the box exactly so no jar will



The Ford Timer Components Disassembled from the Camshaft and the Terminals of the Primary Wiring.

1—Timer Case and Terminals.
2—Timer Brush or Arm.
3—Timer Brush Cap.

4—Brush Cap Pin.
5—Primary Cable and Terminals.

change their relation with the terminals.
(To Be Continued.)

BOSTON TO SEE "TANK."

One of the British "tanks" that attracted world-wide attention following the battle of Combles will be put on exhibition and will be put in operation at the Allied Bazar, to be held in Mechanics' building, Boston, Dec. 9-20.

As the tank is so heavy and ponderous that it could not be displayed inside the main hall, the committee has provided for the erection of a large tent in which the machine will be shown in operation.

It is understood that the "caterpillars" will be constructed in this country, but super-structure, or "tank" part, will come from England.

**FOOT OPERATED SWITCH.**

(Figure 244.)

Small electric motors, such as are used for individual buffers, emery wheels or drills, where the current is used frequently, but not for any great length of time usually are not, as a general rule, operated through a rheostat, but by means of a simple throw switch. When the use of these devices is wanted it is almost always at a time when the hands are covered with grease and oil, resulting in the ever present danger of getting an electric shock when throwing the switch. An ingenious mechanic has devised a means of operating the switch by the foot. This device consists of a block of wood forming a foot pedal, hinged to another piece secured to the floor. To the electric switch handle is attached a weight suspended by a stout cord, to keep the switch open when pressure is released. The foot pedal is connected to the switch handle by a piece of window curtain cord running over a pulley in such a manner that by pressing down on the pedal the switch is thrown in connection and the apparatus started. When the operation is over the foot pressure is released, which throws the switch, thus shutting off the current without further attention.

HOME MADE PIPE WRENCH.

(Figure 245.)

It often happens that when one most needs a certain tool it cannot be found, which case calls for a substitute. When the stillson wrench is mislaid, a substitute device can be provided by placing an S wrench of a size that will slip easily over the round piece to be turned, as shown in the sketch. Between the jaw and pipe insert a flat file so that a fairly tight fit is obtained. Pressure upon the wrench will bind the file against the work and the wrench jaw so that the piece can be turned easily.

EMPTYING OIL BARRELS.

(Figure 246.)

To transfer the contents of a barrel of oil to a tank in the garage try the following method, which has been adapted by an enterprising garage man who believes in making machinery work for him: Place a three-inch wooden plug tightly in the barrel, as shown, and into this fit snugly the entire valve stem

taken from an old inner tube. Also tightly fit an old gas pipe into the plug, allowing it to extend near the bottom of the barrel. The pipe should be led to the garage tank to be filled. To operate it is only necessary to attach the hose of a motor driven tire pump installed in a car to the valve stem. The pressure of air will force the oil from the barrel quickly and more thoroughly than is possible with the hand pump usually used. The method also eliminates the inconvenience of tipping the barrel upside down over the tank.

POURING LIQUID FROM A PAIL.

(Figure 247.)

Few persons can pour the liquid contents from a pail, or even a tumbler, without spilling some on themselves or the ground. Try this method, which is as old as the proverbial hills, but seems to have been forgotten by many. Hold a rod or wire against the lip of the vessel from which the pouring is done, in such a way that the liquid will flow down the rod without spilling. This is very simple and eminently effective.

HOME MADE LEAD HAMMER.

(Figure 248.)

Nothing is as good as a lead hammer for giving heavy blows without doing damage by marring a surface. A suitable hammer may easily be made from some old lead pipe and some gas piping. Half way down the side of an old tomato can of small size cut a hole so that a piece of $\frac{3}{8}$ gas pipe will pass through with a snug fit. On the end inside the can screw on a $\frac{3}{8}$ by $\frac{1}{4}$ by $\frac{1}{4}$ T and in the $\frac{1}{4}$ ends of this screw in $1\frac{1}{2}$ -inch nipples. Adjust so that the axis of the can and the axis of the $\frac{1}{4}$ pipe holes will coincide. Have the $\frac{3}{8}$ pipe extend beyond the can a distance such as will afford a suitable length for the hammer handle. Set the can upright on the bench with open end up and support the pipe so that the correct position will be maintained. Now melt in a plumber's furnace some old lead pipe or other lead scraps and when molten pour into the can. When cool cut away the can and smooth off the edges of the lead head and the result will be a most satisfactory lead hammer.

PUTTING FLANGE ON TUBING.

(Figure 249.)

A simple way to make a flange or rolled edge on copper tubing when installing a new gasoline line is as follows: Mark a centre line on a block of hard wood and along the line bore three or four holes of sizes corresponding to the outside diameters of the most common sizes of tubing. Then saw the block longitudinally in two sections through the exact centre of the holes. Place the tube in its proper hole in the two sections and clamp in a vise, allowing the tube to extend $\frac{1}{4}$ inch above the surface of the block. The flange or roll can be made by driving in a round nose punch of suitable size placed in the top opening, as shown.

CHEWING GUM IN REPAIR WORK.

(Figure 250.)

It not infrequently happens that the amateur repair man is unable to replace a nut on a bolt located in some part of the machine where the designer evidently did not take into consideration the fact that space is required for the fingers or other tools in working on the same. This often results in the loss of one's temper and a waste of much time. Quite often in a place of this kind the nut can be easily put on by sticking it on the end of a stick with a wad of chewing gum and holding it against the bolt, turning it until the thread catches.

VALVE SPRING GAUGE.

(Figure 251.)

A device for readily measuring the tension of valve springs is illustrated herewith, it being based on a suggestion by the American Technical Society. It consists of two pairs of stiff sheet metal strips fastened together by rods or long carriage bolts and so arranged that one strip of each pair, sliding on the rods works between the two strips of the other pair. A glance at the drawing will make this clear.

One pair is fastened to a spring scale secured to a ceiling or other support, and the other to a hand lever. The spring to be tested is placed between the two strips, on one of which is a graduated rod, which slides through the other. When using the device pressure is exerted on the hand lever to compress the spring, register the tension on the

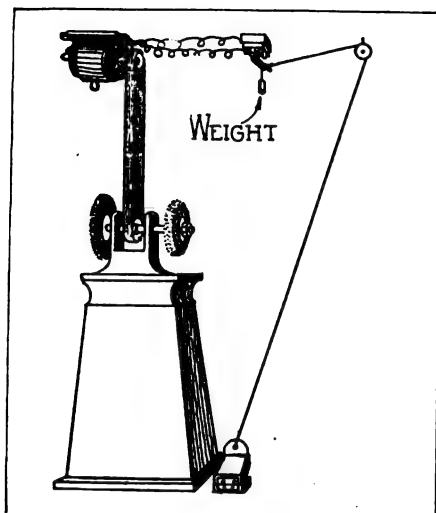


Fig. 244—Handy Arrangement for Operating Switch with Foot.

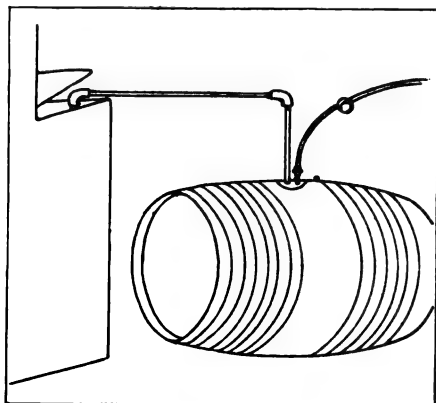


Fig. 246—A Means of Emptying Gasoline to Prevent Wastage.

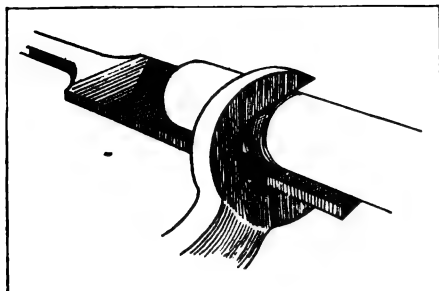


Fig. 245—Utilizing File and S Wrench to Turn Round Pipe or Stock.

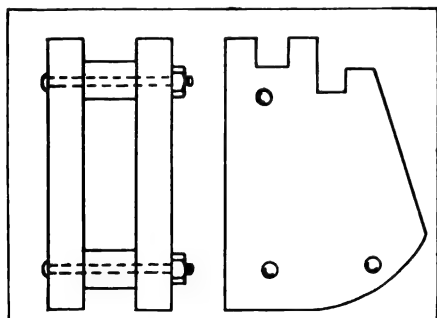


Fig. 252—A Handy, but Not Adjustable Jack for Use Around the Garage.

spring scale and also showing the distance the spring has been compressed.

HANDY GARAGE JACK.

(Figure 252.)

A handy jack for use around a garage that will be quick acting, although not adjustable, may be made from a couple of good heavy boards cut with a rounded corner as shown in the sketch. Two boards cut alike should be bolted together by means of a third "spacer" board, so that the jack will be stable and not fall over sideways when in use. Two notches are cut in the boards, one for the front axle and one for the rear axle, these, of course, to be at the proper height from the base. The jack is put in place with the slot under the proper axle and by the power of the car or by other means the car is forced by the rocker section action of the jack up onto it, off the ground. To remove from the jack it is only necessary to push the car in the proper direction.

LOCATING COTTER PIN HOLES.

(Figure 253.)

In removing a nut held by the cotter pin one is invariably so intent in getting the nut off that the location of the cotter pin hole is seldom noticed. In fact, it is doubtful if this is ever thought of by the average layman, until such a time as it is desired to put it back when the nut is again in place. A simple way to make sure of the location of the hole is to mark the end of the shaft by means of two notches cut in the edge with a cold chisel in the same plane as the hole or by a straight line cut on the end with a cold chisel. See sketch. When putting on the nut it can be screwed up tightly until the castellated openings in it line up with the marks on the edge of the bolt, at which time the cotter pin can be easily inserted.

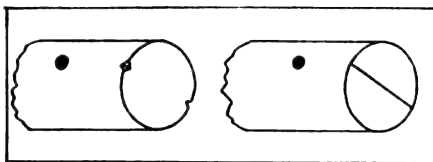


Fig. 253—A Useful Suggestion for Locating Cotter Pin Holes.

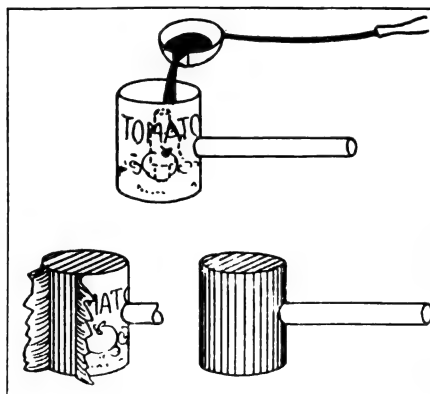


Fig. 248—How to Make a Hammer That Will Not Mar Paint or Metal.

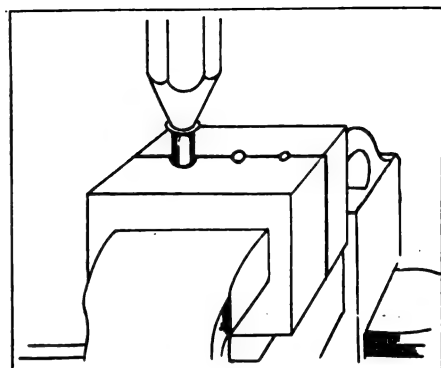


Fig. 249—A Quick and Easy Way of Putting a Flange on Tubing.

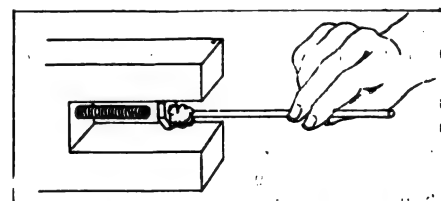


Fig. 250—How Chewing Gum Often Can Be Used in Repair Work.

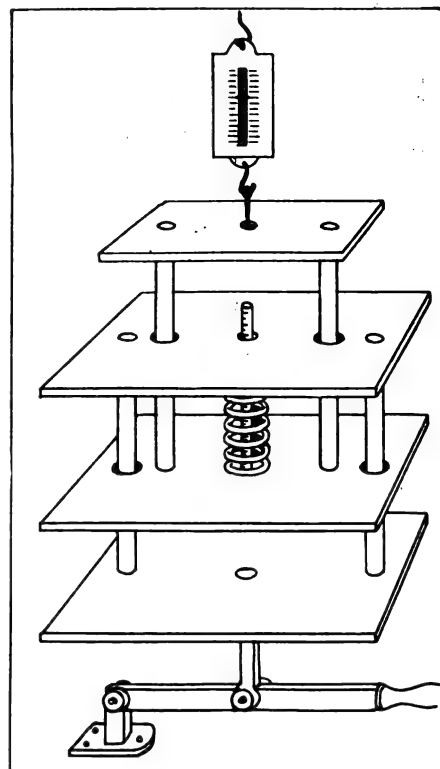


Fig. 251—A Device for Quickly Determining Tension of Valve Springs.

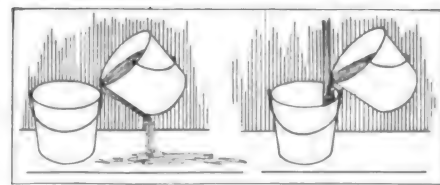


Fig. 247—A Practical Suggestion for Pouring Liquids from a Pail.



"CONSTOLITE" FOR FORDS.

"Constolite" is designed to automatically regulate the light from the Ford head lamps. It is wired from the magneto and is controlled by a switch conveniently located on the steering post. It consists of a combination of coils so perfectly balanced that it does not injure the magneto nor interfere with ignition. It is attached to the right hand side of the dash, under the hood, alongside of the terminal end of the lighting switch, and the wiring from this is run to the switch, which is part of the equipment. When installed with head lamps in multiple, this device gives, at approximate car speeds of from seven to 20 miles an hour, a light of from two to five times as much as the regular Ford head lamps and at speeds above this the output of light remains constant, giving a more uniform driving light at high speeds. With this device it is possible to dim the headlights when running at high speeds and to keep one light going should the other become disabled. The device is entirely automatic in its action and is waterproof. It is a rugged and thoroughly practical instrument, requiring no adjustments, and can be installed by anyone in a few minutes.

Made by the Detroit Starter Company, 203 Main street, Detroit, Mich. Price complete, \$4.85.

NEW BADGER BUMPER.

This bumper is designed especially for the latest model streamline cars, the bar being carried at a height that offers full protection to the lamps and fenders, as well as the entire front of the car. The substantial fittings or arms conform to the lines of the car, and embody the latest ideas in bumper construction. The illustration shows a design entirely new and individual, called the Protext. Being universal in application, it will fit all standard cars. It may be had fitted with any of the following list of Badger bars: Channel, spring, diamond or round. Of the diamond and round styles there are various sizes to choose from. Finished in either nickel, brass or black.

Made by the Auto Parts Manufacturing Company, 319 Milwaukee street, Milwaukee, Wis. Prices from \$5.50 to \$11, according to size, shape or finish.

LEGAL-BRITE HEADLIGHT FRONTS.

This device is installed on the headlights to diffuse the light for city driv-

ing and yet give the full benefit of the lights for country driving. It consists of a circular piece of sheet steel to fit over the headlight glass, in the centre of which is a circular opening of generous dimensions. Arranged to fit into this opening is a prismatic glass disc, which is held securely in place by a spring lock wire. For driving in the city this prismatic glass is put in place and kept there. It gives a bright illumination in all directions, not only showing the path directly in front of you, but also illuminating at either side and at the same time making it easy for oncoming drivers to see what clearance to allow in passing. When driving in the country the prismatic glass is removed by releasing the spring lock wire, which is easily done with one's fingers. This gives the light its full power with its searchlight effect.

Made by the Vesta Accumulator Company, 21st street and Indiana avenue, Chicago, Ill. Price, \$3.00 per pair.

FAW'S SEARCHLIGHT MIRROR.

One of the most recent and practical developments in the field of automobile searchlights is the detachably mounted mirror for the Culver Stearns Giant searchlight designed by J. H. Faw of J. H. Faw, Inc., 41 Warren street, New York City. This mirror can be placed at any angle on the back of the Giant light and thus serve a twofold purpose. It is readily removable for repairs and eliminates the necessity of sending the whole lamp back to the factory in case of breakage, which allows the lamp to be used until the repairs are completed.

This is the first time a mirror has been detachably mounted on a spot light and marks considerable progress in this line. The mirror attachment makes for flexibility of usage and is a great improvement over the types in which the mirror is so fixed that it is practically impossible to use the lamp from either side or change the mirror to a desired position, since it is built permanently into the lamp shell.

With the new attachment the Culver Stearns Giant searchlight is certain to meet with an even greater demand than experienced this past year. The detachable mirror is priced at \$1.50, making the total price of the Giant light, with mirror, \$6.50.

Marketed by J. H. Faw, Inc., 41 Warren street, New York City. Full details of this device, as well as the items of the extraordinarily large line of Faw accessories, will be sent upon request.



REO GARAGE GAS HEATER.

This heater may be run by natural or artificial gas. It consists of an outer cylinder in the base of which is the burner. Inside of the outer cylinder are two concentric cylinders placed over the burner and sealed so that the flame and fumes are contained in the space between them and which space is connected directly to the outer air. Fresh air enters the outer cylinder and passes around the concentric cylinders and inside the inner one, whence it circulates about the garage and heats the same. In this way there is no contact with the flame of the burner or any gasoline fumes that might be there. The burner itself is not only controlled from the outside of the heater, but there is a regulator needle valve which enables the mixture to be properly made from any gas pressures. The heater is about four feet high and about a foot in diameter.

As it burns about four times as much air as gas, it is claimed to be very economical in gas consumption.

Made by the Edwards Manufacturing Company, Cincinnati, O. Price upon application.

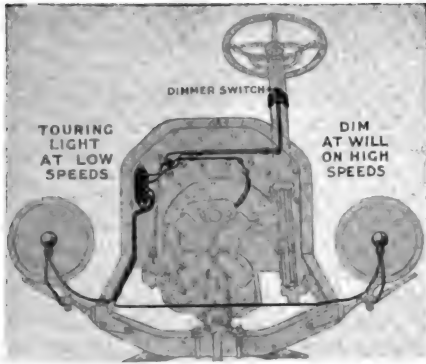
MAJOR SPRING LUBRICATOR.

The Major spring lubricator is intended to be applied to cars that already have no provision for keeping the springs lubricated. It consists of a case to be wrapped around the springs, enclosing them in a dust and water proof covering and keeping them also encased in a bath of lubricant, which is contained in the case. The action of the spring every time the leaves move draws more of the oil between them, thus at all times tending to make the leaves slide on each other on a film of oil. The lubricator prevents rust and gives the effect of springs in a constant state of newness.

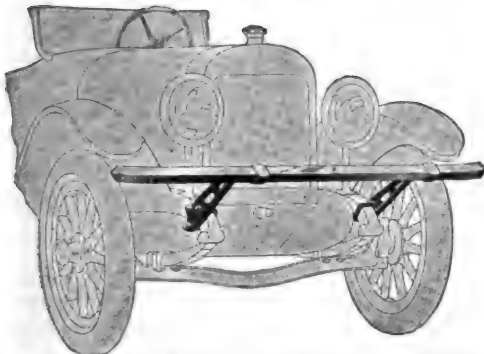
Made by the Major Manufacturing Company, 461 Pearl street, New York, N. Y. Retail prices for Ford, \$12; for five-passenger car, \$20; for seven-passenger car, \$25. For larger cars and trucks in proportion.

OIL DISTRIBUTOR FOR FORDS.

This device is claimed to increase the mileage per gallon of lubricating oil in a Ford motor, reduce the formation of carbon to a minimum, prevent fouling of spark plugs and over lubrication, as well as scanty lubrication, improve the run-



Controlite for Fords; Made by the Detroit Starter Co., Detroit, Mich.



New Badger Bumper; Made by the Auto Parts Mfg. Co., Milwaukee, Wis.



Legal-Brite Headlight Fronts; Made by the Vesta Accumulator Co., Chicago.



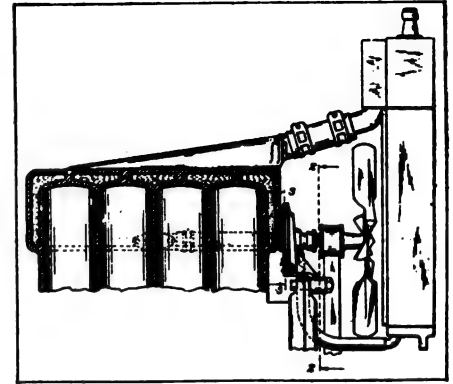
Faw's Searchlight Mirror Attached to C-S Giant Searchlight; Marketed by J. H. Faw, Inc., New York City.



Major Spring Lubricator; Made by the Major Mfg. Co., New York City.



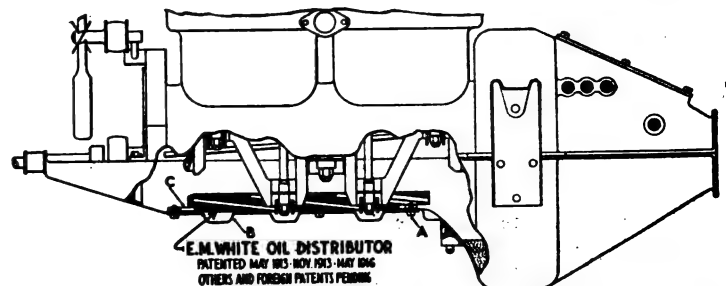
Eureka Shock Absorber; Made by the Auto Accessory Manufactory, Canisteo, N. Y.



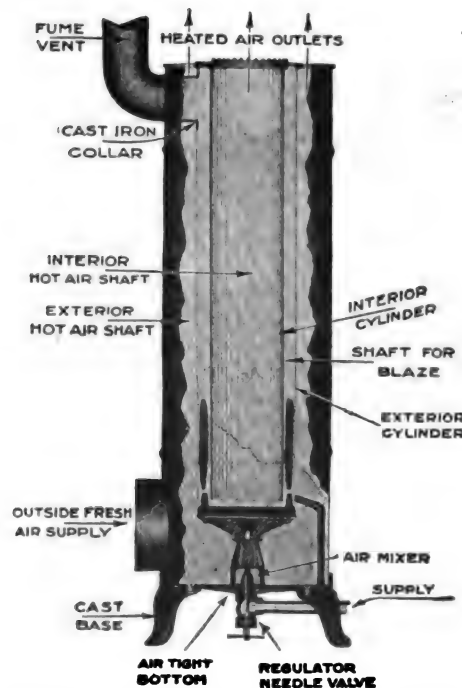
Water Pump for Fords; Made by the Hughes Bull Co., Detroit, Mich



E-Z Valve Lifter; Made by the Syracuse Wrench Co., Syracuse, N. Y.



Oil Distributor for Fords; Made by the Evapco Mfg. Co., Detroit, Mich.



Reo Garage Gas Heater; Made by the Edwards Mfg. Co., Cincinnati, O.



Never Skid Truck Chain; Made by the Never Skid Mfg. Co., New York City.



Apco Grinding Outfit; Made by the Auto Parts Co., Providence, R. I.

ing of the motor and prevent loss of power and heating on grades. It consists of a series of troughs made of steel combined to form a single unit and placed inside the crank case, on the right hand side. The oil splashed from the small pockets by the cranks is caught and carried by the troughs to the rear step by step to the main reservoir or flywheel housing. This movement prevents the accumulation of lubricating oil under the cranks, especially No. 1. While extremely simple, it is claimed to be "miraculously efficient."

Made by the Evapco Manufacturing Company, 427 Grand River avenue, Detroit, Mich. Price, \$3.00.

"E-Z" VALVE LIFTER.

This device consists of two jaws joined together in U shape form, the action being controlled by an adjustable handle and toggle link arrangement. The ends of the jaws are flattened and provided with beveled slots. These are inserted between the tappet and the washer retaining the valve spring. One throw of the handle lever compresses the spring; at the same time, being self-locking, it will retain its position. It is not necessary to remove the valve to grind it in. This tool, having a vertical lift, does not bind or lift the valve stem. It allows the free use of both hands and makes the release of the valve spring an easy matter.

Made by the Syracuse Wrench Company, Syracuse, N. Y. Price, 75 cents each.

EUREKA SHOCK ABSORBER.

This shock absorber consists of coiled springs encased in a mud, dirt and water proof cylindrical casing. Each absorber has five feet of continuous spring, which because of its great length, working under compression, absorbs all shocks from ordinary roads before they reach the rider. Under compression there are two coils in each casing, one of which does not come into play unless heavily loaded. By this arrangement ease of riding is obtained with a light load and no adjustments are required for different loads, the springs themselves taking care of this. It is claimed that these are the only absorbers that satisfactorily absorb the "upthrow."

Made by the Auto Accessory Manufactory, Canisteo, N. Y. Prices, \$10 to \$25.

APCO GRINDING OUTFIT.

A complete outfit for grinding the valves in a Ford car is now marketed by the makers of the Apco specialties. This equipment consists of a valve spring remover which permits of the use of both hands when working on a valve; a grinding tool that works as easily on the last cylinder as on the first, and a large size box of carborundum grinding compound.

Manufactured by the Auto Parts Company, Providence, R. I. Price for complete outfit, 60 cents.

NEVER SKID TRUCK CHAIN.

A good traction and anti-skid device is necessary on every truck. Illustrated herewith is one which is said to more nearly meet the different requirements than most others. It consists of a number of cross pieces spaced at equal distances along the circumference of the wheel and held in place by a chain which sets in the groove of a dual tired wheel. These cross pieces are made of woven steel wire, making them unbreakable and giving a great gripping surface. Turn buckles are provided to allow for adjustment on account of wear of tires, etc. It is not necessary to jack up the wheels to put on these Never-Skids, and they are constructed so that they cannot foul the driving chain. Being comparatively soft and flexible they will not injure the tires or wheel. A special fitting tool is furnished with each set. They are made in various sizes and designs.

Made by the Never-Skid Manufacturing Company, 122 Liberty street, New York, N. Y. Prices and details upon request.

WATER PUMP FOR FORDS.

A new and useful accessory for Ford cars is a centrifugal water circulation

pump. While applicable to all Fords, it is especially attractive to Fords used as delivery vans, as it is these that are most susceptible to overheating troubles. It consists of an efficient centrifugal type pump attached to the front gear cover in combination with the fan, taking the place of the arm which now carries the latter. It is driven by the fan belt and provides for the adjustment of the same exactly as at present. The only alteration necessary is to change the present fan spindle for one somewhat longer, which is part of the pump. It is made of machined castings and has a long bearing lubricated from the end and also an efficient packing gland to prevent water leakage. The capacity of the pump is rated at from 10 to 15 gallons a minute, increasing the efficiency of the motor and preventing overheating with its consequent loss of power. As the fan is driven by belt and the pump is connected with the fan, it is an easy matter to disconnect the same should the pump freeze up, thus preventing damage to it. The position of the pump directly back of the fan gives it all the cooling effect of the latter. It is only a matter of a few minutes to fit it.

Made by the Hughes Bull Company, Detroit, Mich. Retail price, \$4.85 complete.

The Principle Behind Anti-Skids.

W. F. Pfeiffer, Miller Company Expert Discusses Relation of Safety to Anti-Skid Tires.

While safety is the object of the irregular surfaces on tire treads, there are other things that must be taken into consideration, according to W. F. Pfeiffer, general manager of the Miller Rubber Company of Akron, O., manufacturers of the "Miller geared-to-the-road tires."

"The protection should be effective as long as the tire lasts," Mr. Pfeiffer says. "The irregular surface must be prominent enough to afford traction and safety, and yet be so designed that the tire will run smoothly and without vibration, be safe against breaking or chipping, and so constructed that it will not jeopardize the interior construction of the tire by bending or twisting the fabric under the weight of the car."

"When it was put up to the Miller laboratory to design the Miller tread, all of these points had to be considered. The safety idea was evolved by the mechanical department. It was this, the time to prevent skidding is not after the car starts to slide, but before. Only a few inches of the tire is in actual contact with the ground while the tire is running. The protection must be at that point."

"Suppose the rear wheel of a car were gears, digging right into the road. It would be absolutely impossible for the car to skid, because it couldn't get started. If the first inch of skid can be pre-

vented the car is safe. Why not use a design as nearly possible like a gear, yet embrace the other qualities necessary. A continuous band was suggested for the centre of the tread with gear like projections at the side. It was figured that while running on pavements and hard roads where vibration had to be contended with, this band would constitute a smooth running service and at the same time protect the car against side skid on slant surfaces.

"While running on soft ground, mud or snow, the projections on the side would afford the traction grip necessary for safety against the wheels spinning, which is the fatal start for a skid. For a tire does not skid sideways until it has first lost its traction grip on the road. The gear like projections being connected with this continuous band would be firm and rigid, protecting the interior of the tire and insuring safety to the last mile, which would not be true if each projection was an individual unit. After this was all decided and the tread aptly named, "geared-to-the-road," it was tried out under all manner of service before being put on the market."

On some days during the present year over 500 cars have passed through Elkhart, Ind., on the Lincoln Highway. The number going in either direction was about evenly divided.

MOTOR STARTING AND CAR LIGHTING.

The Several Types of Windings in Conventional Generator or Motor Design--the Movement of the Current While the Machines Are Being Operated.

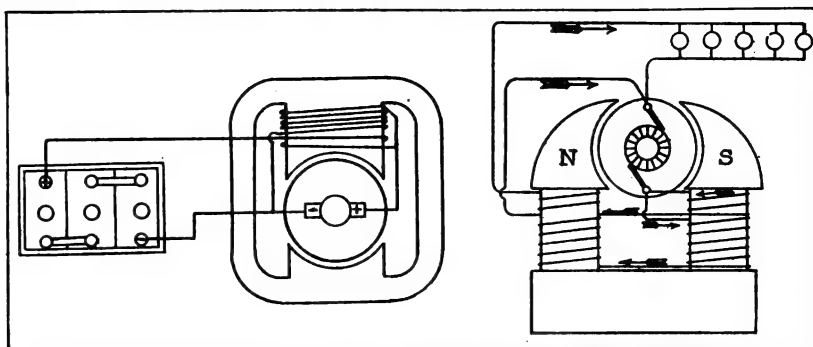
THE power of the motor is proportionate to its speed and to the torque, which is the effective energy that may be exerted upon the pinion or gear secured to the end of the armature shaft and through which the driving effort is applied. This power is measured by pounds weight, the diameter of the pinion or gear and the number of revolutions a minute.

The Types of Field Windings.

The field windings of the machine may be either permanent magnets or electromagnets. No coil or winding is necessary to make them magnetic if they are permanent magnets, so that the current may be taken direct from the brushes and applied to the work without energizing the fields. Generally, however, the generators or dynamos designed for starting and lighting systems have fields that are made by winding coils of wire around cores or field pieces of soft iron, and these field pieces are transformed into magnets by passing electric current through the coils of wire. The current required for energizing the fields is taken from the machine itself. The soft iron cores of the fields would give no flow of magnetic lines of force through the armature to begin with if the field pieces did not remain magnetic. In such a condition the generator would not generate current, but as no piece of soft iron will lose all of its magnetism unless special means are taken to demagnetize it, there is some degree of magnetism remaining in the field poles at all times; and this magnetism is sufficient to cause lines of force to flow through the armature to start generation of current as the armature is turned, no matter how slowly, and as the movement is increased the current is strengthened, the field magnets become stronger and the output of the generator is rapidly increased until it reaches the maximum intended by the designer. If the machine is effectively operative it will require but a few seconds to develop its full current production.

At this point a brief description of the windings is desirable. Any type of single winding about a field pole must have two ends. There must be two leads from the generator to the outside circuit, one of which is positive and the other negative. Were one of the wires of the outside circuit attached directly to the positive brush

and the other to the negative brush, there would be no connection with the field windings, and there would be no means of energizing the field coils. Were the field pieces permanent magnets the coils would not need energizing, but to energize them the current is carried from the brushes through the field windings. This is done by extending one wire from either the positive or the negative brush directly to the circuit, but the other wire is extended from the other brush to the field coil, and the winding so connected is connected with a wire that is coupled to the outside circuit. This arrangement means that all of the current at one brush is through a direct connection with the outside circuit, but the current at the other brush is either sent to or received from the outside circuit through the field coils. If the positive brush is connected direct the current is sent to the field windings and



Typical Example of Compound Wound Generators and the Movement of the Current Through the Circuits.

through the circuit before it returns through the negative brush. This is the series arrangement of winding in which the current is said to pass through the armature and the field in making the circuit. This is a very general construction with motors and it has special qualities. One of these is that it will automatically adjust the consumption of power to the load, consuming a small current with light loads, and as the resisting torque is increased the power needed for the work is constantly absorbed, so that there is high efficiency when the overload is very large. In this type, as the total internal resistance is equal to the combined field and armature resistance, the current consumption is the same under an even load at any speed, and the torque is approximately proportionate to the current.

The Shunt Wound Coils.

The shunt wound machine has field coils that are made with large numbers of turns of very small wire so that there will be much greater re-

sistance in the coils than there is in the outside circuits. From one brush end a wire is extended to one end of the field coil and a similar wire from the other brush to the other end of the field coil. The brushes are connected with the outside circuit in the usual manner. This gives two complete circuits. The greater part of the current will be sent through the outside circuit, which is the path of least resistance, but a small part of it will be sent through the other circuit through the field coils from brush to brush. The ratio of the current that will pass through the field will depend on how many times greater is the resistance of the field coil than the resistance of the outside circuit. Generally the shunt circuit is made with such resistance that $1/20$ of the total current generated goes through the field coil and $19/20$ goes through the outside circuit.

The Compound Wound Type.

The compound wound machine is built with the field coil windings the same as for the series wound and for the shunt wound machines, there being two separate circuits from the one brush to the field primary coil and the field shunt coil, and

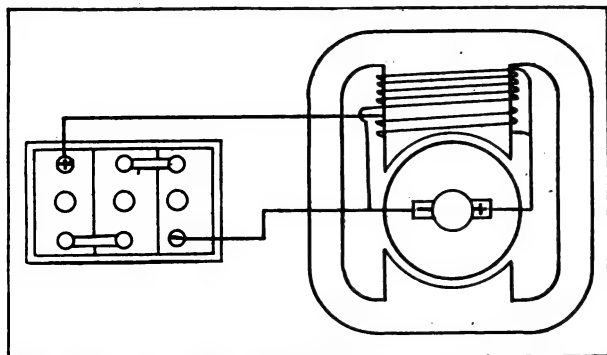


Illustration of a Reversed Series Field Winding in Which the Shunt Field Current Opposes the Current Through the Series Field.

the current will go through both of them to all the pole fields. The other end of the primary winding will continue as one side of the outside circuit. The other end of the shunt winding will be connected with the outside circuit that is connected with the other brush. One of the essentials is that the series and shunt windings will be so arranged that both windings will make a positive pole at one end of the magnet and a negative pole at the other.

The Reverse Series Winding.

The reversed series wound machine differs from the compound wound in this respect, that the current in the field coil moves in one direction and the current in the shunt coil in the direction opposite to that in the field coil. The effect of this is to reduce the strength of the magnet, for as all of the current that is taken from the machine must pass through the series winding.

The current induced in the armature windings will be constantly changed in direction and strength as the windings approach and recede from the pole pieces, the current rising from zero

to maximum and subsiding from maximum to zero so long as the movement of the armature continues. The current is changed to flow in one direction by the commutator.

The number of coils of wire carried by the armature varies according to the design and the purpose for which the machine is to be used, but may be from 12 to 30, and with each revolution of the armature there are changes of the flow of magnetic lines of force. The greater the number the more steady the flow of current, and as the pole pieces are multiplied there are either double or triple the total that would obtain with a single pair of poles. When the lines of force pass through the armature in one direction, the induced current in the coil flows around the coil in another direction. And with the reversal of the flow of the lines of force through the coil the flow of the induced current is reversed.

The Collection of the Current.

As there will be a positive and a negative end to each loop or coil during one-half of a revolution of the armature, the polarity of these ends will be changed during the remainder of the revolution, so that the end that was positive will become negative and the end that was negative will become positive. The alternating current is not changed by the commutator, but by it the positive current is taken from the armature by one wire of the circuit and all of the negative current by the other wire, so that there is from one brush or one series of brushes a positive current and negative current from the other brush or brushes. The leads from the brushes are to the positive and negative terminals. From this description one will realize that one of the brushes, or a series of them, is always in contact with that part of the commutator that receives positive current and the other or the other series in contact with that part of the commutator that is negative. All of the brush holders are insulated and the brushes are composed of a grade of carbon that is soft and fine, or a mixture of carbon and graphite or copper or a composition of carbon and copper. There is always the same number of brushes that there are poles, and there may be additional brushes that deliver current to the commutator for the regulation of the circuit.

The generator has been described so far as is necessary with relation to current production principles, and the reader has been informed that this machine differs from the motor only in the position of the brushes. With the generator the residual magnetism (that remaining in the field coils) is sufficient to excite the field windings and pole pieces when the machine is started to generate current, and this current will further energize the pole pieces and convert them into strong magnets.

What Drives the Motor.

But with the motor there will also be residual magnetism, and this will be augmented

when current is supplied to the windings of the pole magnets and the windings of the armature. The opposite poles of the armature will be attracted by the magnetic action of the pole pieces and the armature will be rotated. In the generator or dynamo the lag of the current to a certain extent resists the rotation of the armature, but in the motor this becomes a magnetic drag that is a propulsive force, turning the armature and constituting the influence that the magnetic field exerts upon the armature winding, through which the current is flowing.

As the armature is caused to rotate between the pole or field pieces, and the magnetic action assists that rotation, the interruption or cutting of the lines of force creates or produces a counter electromotive force which is increased as the speed of the armature increases. This results in the strengthening of the magnetic field and the large number of lines of magnetic force created. But as the armature speed is increased there is lessened resistance to its motion, and because of the greater counter electromotive force less energy is absorbed. As the load is placed upon the motor and the armature speed is retarded the counter electromotive force generated is less and there is a corresponding increase in the energy absorbed.

The electromotive force produced by a dynamo is proportionate to the number of turns wound upon the armature and the speed of rotation within certain limits. As the rotation of the armature produces a series of reactions between the windings and the magnetic field, the armature is transformed into a magnet that is polarized at certain definite points in its rotation. These points or polarity are, according to the accepted law of induction, at right angles to the lines of force, and as the neutral points are the points of contact between the brushes and the commutator, where the current leaves and re-enters the windings of the armature, the armature is constituted of two separate magnets with two north and two south poles, each pair of poles being an equal distance from the contact of the brushes. The two north and two south poles really serve as single poles and at the extremities of the diameter of the armature cause the distortion of the lines of force with the rotation of the armature.

The induced polarities of the armature, the one resultant from the induction from the field and the other from the induction from the armature winding, cause the distortion of the magnetic field, and the current moves from the north poles of the armature windings through the armature

to the south poles, and thence through the pole pieces of the magnetic field to the north poles of the armature, forming currents moving in opposite directions at either side of the contacts of the brushes. The induced current in the armature moves at right angles to the direction of the inducing current in the windings. With the motor, however, the electromotive force moves in the armature in a direction opposite to the current. As before stated, the current supplied to the circuit, influencing the windings of the motor armature and the windings of the pole magnets, causes polarity in both, and the magnetic action is attraction of the opposite poles of the armature, which exerts a propelling effect or driving force.

(To Be Continued.)

MOVIES OF AUTO INDUSTRY.

A New York corporation has taken moving pictures in the plants of a number of automobile

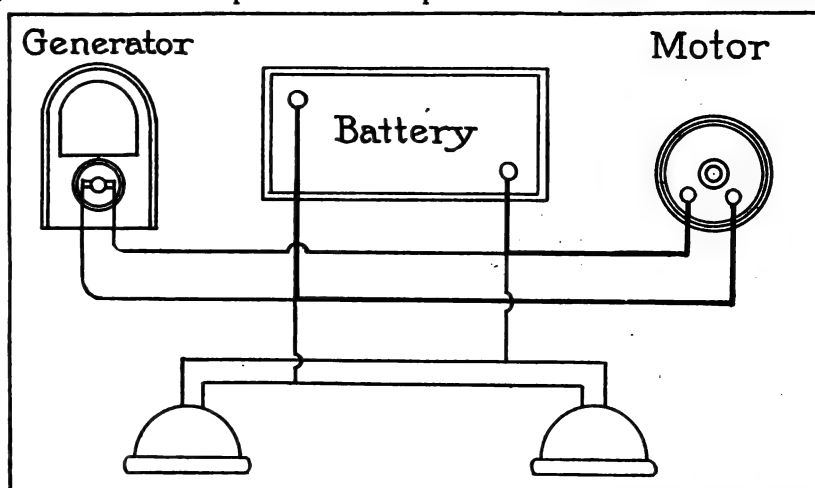


Diagram Showing the Connections of the Generator, Battery and Motor for a Typical Starting and Lighting System.

manufacturing companies, which will be shown at various theatres throughout the country. This new idea in advertising motor cars is operated by the Animated Advertising Corporation of New York City. It has a chain of moving picture houses through which it syndicates the films.

All of the 14 cars that finished in the Astor Cup races at Sheepshead Bay on Sept. 30 were lubricated with Dixon's graphite automobile lubricants, including Johnny Aitken's Peugeot, which made a new world's record for 250 miles and did not stop once from start to finish.

Robert S. Crawford, one of the pioneer bicycle and automobile manufacturers, died in Pittsburgh, Penn., on Oct. 12. Mr. Crawford for many years operated a large bicycle factory at Hagerstown Md., and was the founder of the Crawford Automobile Company. He is survived by two daughters and one brother.

INDUSTRIAL NEWS AND NOTES.

Two Large Accessory Makers May Merge—Two New Cars To Be Made—General Motors' Plans.

The directorates of both the Perfection Spring Company and the Standard Welding Company of Cleveland, O., have approved a plan under which these two concerns will be merged if the ratification of the stockholders can be secured.

The consolidation plan calls for the conversion of the securities of both companies into a new company which will have an authorized capital stock of \$25,000,000 common and \$10,000,000 preferred, the latter class to be seven per cent. cumulative.

The two concerns at present have combined assets of \$10,000,000. The Perfection Spring Company has an authorized capital of \$2,500,000, of which \$1,000,000 is preferred and \$1,500,000 common. Only \$1,250,000 of the common is outstanding.

Automobile springs are the principal product of the Perfection company, which supplies over 30 automobile manufacturers. Starting business 10 years ago, Christian Girt and M. M. McIntyre, with a capital of \$100 built the business up to \$209,310 in five years. Five years later, during the year 1915, ending June 30, the annual business totaled \$1,645,829. During the last fiscal year it totaled \$3,200,000 and net earnings for the first three-quarters of the year reached \$282,811. At present about 1800 hands are employed at the company's plant.

The officers of the company are: Christian Girt, president and general manager; E. W. Farr, vice president; P. A. Connelly, secretary; T. E. Borton, treasurer. The board of directors is composed of the officials named, together with F. F. Prentiss, C. C. Bolton and W. R. Clymer.

The Standard Welding Company has an authorized capital of \$2,225,000, of which \$2,206,800 has been issued. A varied line of automobile parts and accessories are manufactured, including steel tubing, rims for vehicle wheels, motorcycle and bicycle parts. The annual output includes 50,000,000 feet of tubing and 1,000,000 rims and bands. About 2500

hands are employed.

The officers of the company are: C. W. Bingham, president; H. P. McIntosh, vice president and treasurer; J. H. Champ, secretary. These officers and the following men constitute the board of directors: H. P. Bingham, H. P. McIntosh, Jr., C. C. Bolton and D. S. Blossom.

BIG WINTON PRODUCTION.

The Winton Motor Car Company of Cleveland, O., will increase its production schedule to 4000 cars during the coming season and will also increase the output of gas and oil engines. Additional capital has been secured through the sale of \$1,500,000 seven per cent. cumulative preferred stock of the company. Last year the company manufactured about 2000 cars, but up to that time the production ranged from 1000 to 1300 cars a year.

OLYMPIAN MOTORS COMPANY.

The Olympian Motors Company of Pontiac, Mich., has been organized to manufacture a car to list at less than \$1000. R. A. Palmer, who was organizer and director of the business policies of the Cartercar company, is the promoter of the new enterprise and has associated with him Glenn C. Bull, C. E. Callender and A. Manford Stryker, treasurer, secretary and advertising manager, respectively.

KING TO RAISE PRICE.

The King Motor Car Company has sent a letter to dealers informing them of an advance in the price of the model E King, to become effective within the next few weeks.

The letter was in part as follows: "Due to the increase in price of materials and labor, we must reluctantly in-

crease the list price of the model E King in a few weeks. We are pointing out to you an opportunity to purchase at the present list price an improved car of unusual value which shortly will cost you and your customers more money. This is a specially good bargain because the model E chassis will be continued as our only chassis model.

"We know you will appreciate this early confidential information and that you will use this to the advantage of your customers and prospects. King cars made of material contracted for next year will be at an advanced price, as are practically all other cars."

"JINRIKISHA CARS."

The American Motor Vehicle Company of Lafayette, Ind., will manufacture a small car to be known as the American Junior. This machine will have a 40-inch tread and 70 inch wheelbase and will be sold to the juvenile trade. It is also proposed to market it in China and Japan as a substitute for the jinrikisha in general use in the Orient.

Jacob Weisenthal of Lafayette is president of the company. Louis Marx of Chicago is vice president and W. M. Crockett of Lafayette is secretary. B. J. Mills, a Chicago business man, is one of the principal stockholders. The capital of the new company is \$25,000.

GENERAL MOTORS PLANS.

The financing plan for the General Motors Corporation, as announced in the Oct. 10 issue of The Automobile Journal, has been changed slightly, in that instead of \$100,000,000 the capital will be \$102,600,000.

The plan as presented to stockholders in a circular sent out recently is as follows:

"The General Motors Corporation has been organized under the laws of Delaware with an authorized capital stock of \$102,600,000, of which \$82,600,000 is common stock and \$20,000,000 is non-voting preferred stock. The shares are of the par value of \$100 each. The preferred stock is entitled to receive cumulative dividends at the rate of six per cent. per annum, and is subject to redemption, at



At the New Departure Manufacturing Company's Recent Barbecue 2700 Employees Consumed 80 Spring Lambs, 9000 Ears of Corn, 30 Bushels of Potatoes, 2000 Cans of Corn and Piles of Old Fashioned New England Pumpkin Pie, and Still—

the option of the company, at \$110 a share on Nov. 1, 1918, or any subsequent dividend-paying date. In the event of dissolution, the holders of preferred stock are entitled either to be paid the par value thereof and accrued dividends thereon, or, at the discretion of the directors, to receive, in lieu thereof, a distribution in kind of preferred stock of General Motors Company of New Jersey, on the basis of one share thereof for each one and one-third shares of preferred stock of the Delaware corporation, before any assets are divided among or paid to the holders of common stock. The plan is to become effective as of Nov. 1, 1916, and all exchanges of stock under this offer will be made as of that date. Stockholders of the New Jersey company of record at the close of business Oct. 14, 1916, will thus receive the dividend payable thereon by that company on Nov. 1, 1916. Dividends upon the preferred stock and common stock of the Delaware corporation will be computed from Nov. 1, 1916, upon all of its stock issued and exchanged within the period hereinafter fixed for effecting such exchange."

METZ HAS NEW SALES PLAN.

The Metz Company of Waltham, Mass., has put in force a sales plan which is similar to that inaugurated by the Ford Motor Company early in the fall.

Agencies have been substituted for its branches in a number of cities and it is understood that the company will have several agencies in Boston. The company signed a lease to take over a new building in Boston, where its general sales and service station will be located, and has disposed of its lease on the building at 195 Massachusetts avenue, in Cambridge, which has been used as the sales department for some time. At present the general sales department is conducting its business from the factory.

RAISE HUDSON PRICE \$175.

The Hudson Motor Car Company has announced an advance in price of \$175 on all models to take effect Dec. 1. This is the second increase in prices announced this year. In May last an advance of \$100 was made.

THE EASTERN MOTORS SYNDICATE.

Connecticut May Have Large Car Manufactory --New Wheel Corporation--Injunction Issued.

A number of Connecticut and New York business men have organized a new concern for the manufacture of motor cars. The organization is to be known as the Eastern Motors Syndicate and will develop plans for the car and outline manufacturing details, but the actual manufacture and production of the car will be undertaken by the Eastern Motors Inc.

An option has already been obtained on two plants and a factory location will be selected in the near future. The preliminary work of organizing is in charge of Allen Sheldon, who is chairman of the Eastern Motors Syndicate. Willis D. Upson of Waterbury, Conn., is treasurer; L. S. Hubbard, Bridgeport, Conn., is secretary, and F. A. Law is chief engineer. Mr. Law was at one time chief engineer of the Pope Manufacturing Company and was recently identified with the exporting firm of Gaston, Williams & Wigamore.

BOWER BEARING DIVIDEND.

The Bower Roller Bearing Company has declared a quarterly dividend of 15 per cent., making the third dividend of this amount for the year and a total of 45 per cent. that has been disbursed to stockholders. The directors have also recommended that the stockholders approve the declaration of a 100 per cent. stock dividend at the annual meeting in January.

PREST-O-LITE GETS INJUNCTION.

The U. S. District Court of the District of Indiana has granted a permanent injunction to the Prest-O-Lite Company against the Sun-Lite Gas Company of Indianapolis, and Orion K. Stuart, its president.

The injunction was similar to previous ones granted to the Prest-O-Lite Com-

pany, and compels the defendant to remove the Prest-O-Lite Company name from the tanks and place the Sun-Lite label permanently and prominently thereon; to refrain from dealing in such refilled tanks as Prest-O-Lites, or using the word "Prest-O-Lite in any way to promote their sale; enjoins the defendant or its agents from fraudulent substitution and from infringing or inducing others to infringe upon the rights and good will of the Prest-O-Lite Company.

CHANDLER MODEL CONTINUED.

The Chandler Motor Car Company of Cleveland, O., has announced that for 1917 there will be no change in the Chandler model and that there will be no change in price unless it becomes advisable to increase it. In all probability, it is stated, the price will be advanced.

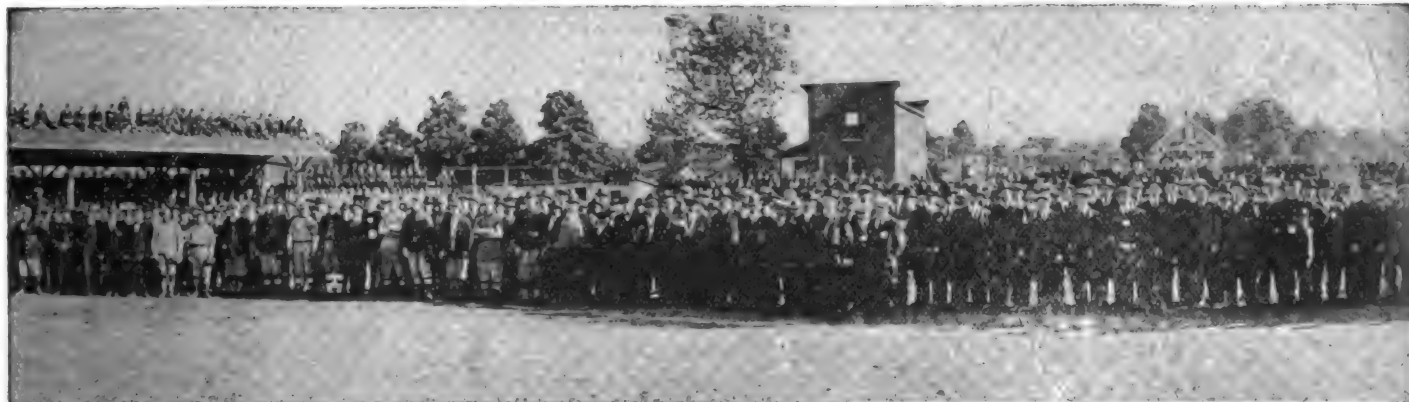
The 1916 production of Chandler cars will total 15,000, while the 1917 production will be at least 20,000 cars. Materials for this production have already been contracted for.

NEW WHEEL CORPORATION.

The Budd Wheel Corporation, with a capital of \$2,000,000, is erecting a large plant with six acres of floor space in Philadelphia for the manufacture of automobile wheels of steel and wire. The product is covered by patents and it is claimed that it has many advantages over the present type of all-steel wheel. The plant will have an equipment valued at over \$500,000, with a capacity of 1000 wheels a day.

The concern is an expansion of the Edward G. Budd Manufacturing Company of Philadelphia, manufacturer of complete pressed steel bodies for automobiles and auto trucks.

The capital of the new concern is made up of \$1,000,000 seven per cent. preferred stock and \$1,000,000 common.



Had Room Enough for Gallons and Gallons of Beverages, and Energy Enough to Engage in Strenuous Athletic Sports Immediately After, and the Next Day to Resume the Production of New Departure Ball Bearings.

What Prominent Men in the Industry Are Doing.

HENRY SPLITDORF DEAD.

Henry Splitdorf, whose name is known throughout the civilized world wherever the automobile is in use, as a pioneer manufacturer of magnetos and ignition systems, died at his home in New York City on Tuesday, Oct. 17.

He started making magnetos in 1858. These machines at that time were known as the Werner von Siemens magnetos and were used for experimental purposes in college laboratories. He later invented and manufactured the Splitdorf coil for firing mines and explosives and also the Splitdorf repeating relay for use in connection with telegraph instruments. The Rhumkroff coil for X-Ray machines is also one of the Splitdorf products. When the automobile industry began to develop Mr. Splitdorf became one of the leading manufacturers in the world of both ignition apparatus and spark plugs.

He is survived by two sons, Charles F., who is vice president of the Splitdorf Electrical Company of Newark, N. J., and John Splitdorf.

R. V. LULL PROMOTED.

R. V. Lull of the sales department of the King Motor Car Company, has been appointed sales promotion manager in recognition of the efficient record he has made with the company.

TURK MANAGES INTER-STATE.

T. J. Turk, chief engineer of the Inter-State Motor Company of Muncie, Ind., has been appointed assistant general manager of the company, which office he will administer in connection with his duties as head engineer. He will devote his time to increasing the production of



T. J. Turk, Inter-State.



J. Murray Page, Locomobile.

Inter-State cars to meet the steadily increasing demand.

RUNYAN WITH WESTCOTT.

Paul W. Runyan has been appointed advertising manager of the Westcott Motor Car Company of Springfield, O. He was formerly assistant to the sales and advertising manager of the Robbins & Meyers Company, manufacturer of electric fans and motors.

NEWARK JOINS CHEVROLET.

J. H. Newark has been appointed to succeed John R. Eustis as advertising manager of the Chevrolet Motor Company and will have his headquarters at the general offices in New York City.

WOODRUFF WITH SIMPLEX.

A. A. Woodruff has been appointed sales manager of the Simplex Automobile Company of New York to succeed R. M. Barbour, who recently resigned. Mr. Woodruff has been connected with the automobile industry for 16 years, during which time he was engaged in manufacturing car bodies and was identified with the E. R. Thomas Motor Company and the American Motors. He joined the Simplex organization this year as manager of the body department, later being made assistant sales manager.

ANDERSON WITH MADISON.

Harry W. Anderson, formerly sales manager of the Stutz Motor Car Company, has taken up a similar position with the newly organized Madison Motors Corporation of Anderson, Ind.

WEBSTER ELECTED PRESIDENT.

Stuart Webster, who has been connected with the Racine Rubber Company of Racine, Wis., since it was started, has been elected president to fill the vacancy resulting from the resignation recently of H. L. McClaren.

The position of vice president vacated by Mr. Stuart has been filled by the promotion of Louis T. Vance, who has been factory manager.

HAMILTON WITH OAKLAND.

A. C. Hamilton has been appointed chief engineer of the Oakland Motor Company to succeed Eric Wahlberg, who recently resigned to take a similar position with the Jeffery company at Kenosha, Wis. Mr. Hamilton was formerly with the experimental department of the King Motor Company.

AGNEW GOES TO CHALMERS.

W. L. Agnew has been appointed director of advertising of the Chalmers Motor Company. He was advertising manager of the Hudson Motor Car Company for four years and prior to that was advertising manager of the Great Northern railroad under the late James J. Hill.

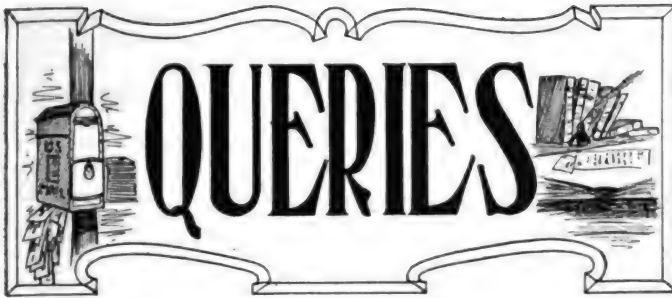
J. MURRAY PAGE AT CHICAGO.

J. Murray Page, who has been with the Locomobile Company of America since 1899, has been appointed manager of the Locomobile branch at 2000 Michigan avenue, Chicago.

Mr. Page has been wholesale manager for the company in the territory west of Salt Lake City. He has been connected with the New York branch, San Francisco headquarters, Los Angeles branch and the factory.



W. L. Agnew, Chalmers.



NOTICE TO READERS.

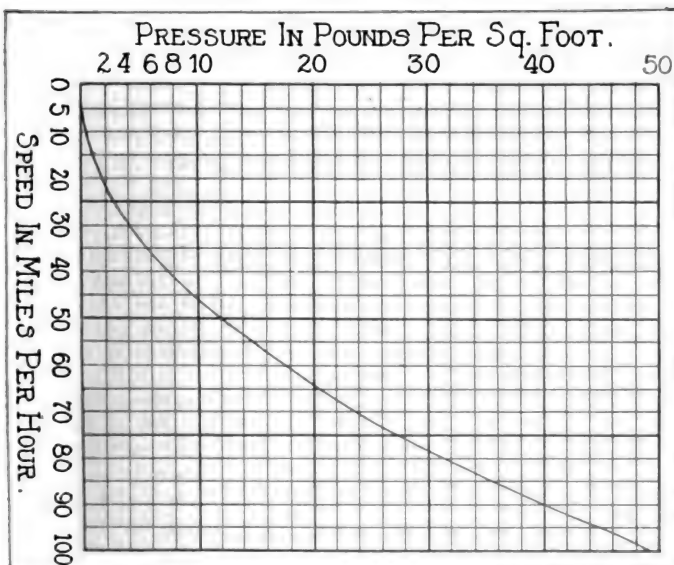
THIS department contains the Mechanical Editor's answers to readers' inquiries. It is open to every subscriber. If any part of your car is not operating satisfactorily, or if you desire information regarding operating, maintaining or repairing motor cars, do not hesitate to lay your troubles before him. He will answer promptly and fully, either by mail or in these columns, as you direct. This service is free to every subscriber, and is often the means of saving considerable money that otherwise would be spent with a garage man. Letters should always be signed with the writer's full name and address, and the car or part in question should be properly identified, by mentioning the maker's name, model, year of production or other distinguishing feature. Address all inquiries to the Mechanical Editor.

WIND RESISTANCE ON RACING CARS.

(T. B. F., Knoxville, Penn.)

In all the racing cars one sees the front end is tapered and the rear is extended to form a long cigar shaped tail. Upon inquiry one is told that this is to decrease the wind resistance. Also in the later model cars I notice that the windshield is slanted backwards. Is this for appearance or is this on account of "wind resistance" too?

Wind resistance while a negligible factor at moderate speeds is very important at high speeds. In fact it has been said that in racing at 100 miles an hour more than 75 per cent. of the power used is to overcome the wind resistance, so you can see that this is really something to be seriously considered. The shape of the car bodies you mention is for a very good purpose and a smooth and properly designed line is a big factor in a car's success. As for the tail piece you speak of this is very important, too, as it must be designed so as to minimize the suction or back pull when the car is travelling fast. On this page you will see a graphical illustration of the effect of wind pressure or resistance at high speeds, shown in the shape of a curve. Upon examining this you will see that as the speed of a car is increased the wind resistance is greater in increasing proportion. To find



Illustrating Wind Resistance at Varying Speeds.

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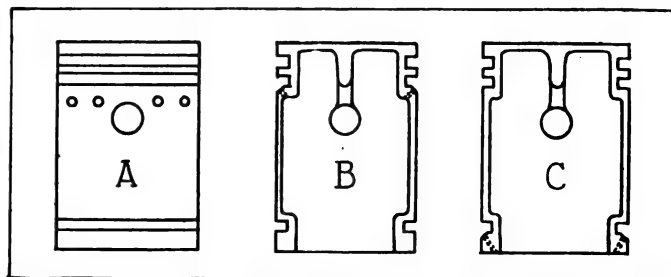
the wind pressure at any speed look up the vertical line representing the speed under consideration and where it intersects the curve draw a horizontal line which by the scale given at the left of the diagram will show the desired pressure. Regarding the windshields of pleasure cars, this slanting is probably more for the effect of appearance and to deflect the wind from the passengers than it is to decrease wind resistance. By the curve shown you will see that within the speed range of the average pleasure car the wind resistance is not very great.

TROUBLESOME SPARK PLUGS.

(F. A. B., Meriden, Conn.)

I have had considerable trouble with spark plugs fouling. No sooner do I get them cleaned and working good for a while than they trouble me again. Can you suggest a means of remedying this trouble?

It is apparent that oil leaks past your piston rings. This may be due to faulty rings, or it may be that the piston and cylinder are out of round. You might try some one of the built-up or so-called leak-proof rings. However, should you not care to do this, bore holes in the piston to carry off the surplus oil, as shown in the illustrations herewith. Many cars today have some such arrangement. If your car has it, try making a few more holes or those that are there a little larger. It may be that a little heavier oil would help you, too. In figure A is shown a method of boring holes in the piston walls between the upper and lower rings, which holes will carry the surplus oil from the cylinder walls back to the crank case. In figure B is shown a method of chamfering edge of piston ring groove of lower ring at top of piston and drilling holes in this so as to take back the surplus oil. In figure C is shown another method, which is similar to the



How to Bore Hole in Pistons to Carry Off Surplus Oil.

foregoing, but done to the groove at the bottom of the piston. The function of this ring is to scrape the oil from the walls of the cylinder on each stroke and possibly a new ring here would be all that you would need to install to overcome your difficulty.

MAKING A CAM.

(R. D. P., Fredericksburg, Va.)

Will you kindly give through your valuable columns some idea of how one should go at it to find the shape of cam for any desired valve action? Also to get more speed and power out of a motor can the valve arrangement be changed by re-setting the gears, or is it necessary to have new cams made?

To make a cam the first thing you must know of course is the timing desired for the opening and closing of the valve. For example, a valve that is desired to open 15 degrees past top centre and to close 25 degrees past bottom centre would give an opening of 190 degrees, i. e., while the crankshaft was turning through 190 degrees of the 360 in one revolution, the valve would be open. Knowing this, it is required to find the shape of the cam.

Lay out a perpendicular line for a centre line and near the lower end of this draw a circle of the size of the cam shaft. Using the same centre, draw another circle that is larger by the size of the cam thickness. This may vary from $\frac{1}{4}$ to $\frac{3}{8}$ of an inch larger than the cam shaft circle, according to the type of motor. Make another circle having its radius greater than the last circle by the amount of clearance desired between the valve stem and tappet. Draw another circle having its radius greater than that of the last circle drawn by the amount of valve lift.

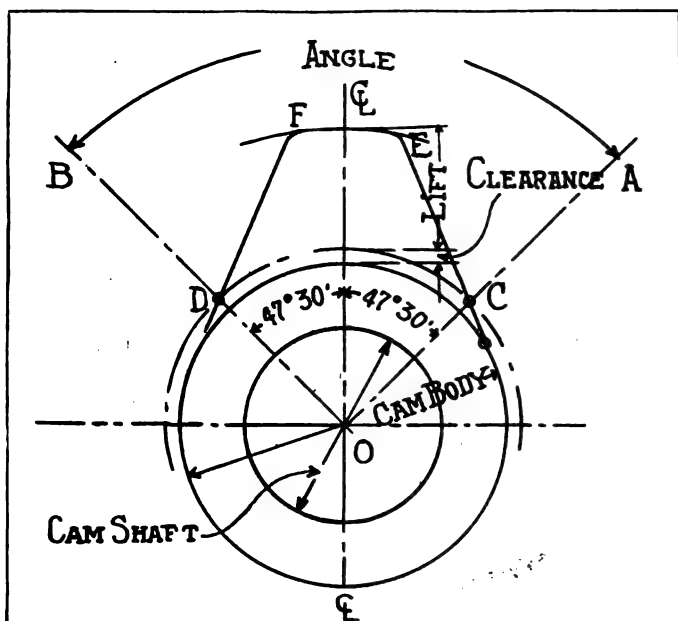
(When Writing to Advertisers, Please Mention The Automobile Journal.)

From the same centre draw the lines O A and O B, making an angle equal to half the degrees the valve is to remain open in relation to the crankshaft. In this case the lines would be drawn 95 degrees apart, or $47\frac{1}{2}$ degrees each side of the centre line. This is because the cam shaft travels at only half the crankshaft speed, hence the degree of travel would be half of what it is in relation to the crankshaft.

Where these lines intersect the clearance circle (third one drawn) (call the points C and D), draw lines which shall be tangent to the cam circle (second one drawn) and extend these until they meet the fourth circle drawn at E and F. At these points round off the corners to eliminate the sharp edges and the resulting outline is the cam shape.

The pattern should be cut out carefully and a template made of it out of some sheet metal. Better still, make the drawing on a piece of sheet metal and cut out and file to the lines accurately. The cam should be made to conform exactly to this shape. This is, of course, for a straight sided cam only and for ordinary work is all that is necessary. In a similar way any other cam may be worked out.

To get more speed from your motor it is necessary to lighten the reciprocating parts. Having done this you may derive some benefit by moving the cam shafts in relation to the crankshaft, but this depends a good deal upon the timing arrangement of the valves as arranged for in the cams. Changing the relation of cam shaft to crankshaft does not affect the



Pattern for Making a Cam.

length of time the valve is open; it changes the time it opens and closes. You may get some satisfactory results, but it is most likely you will have to follow the usual practise of racing machines and install a special set of cams.

In these it is usual, in order to get more speed and power, to have the valves open a little earlier and close a little later, thus giving a longer time that the valve is open, which you can readily see cannot be brought about by shifting the camshaft ahead or back. There is no set rule for these settings as the peculiarities of different motors require different openings and no two racers, probably, would agree on when the valves should open and close.

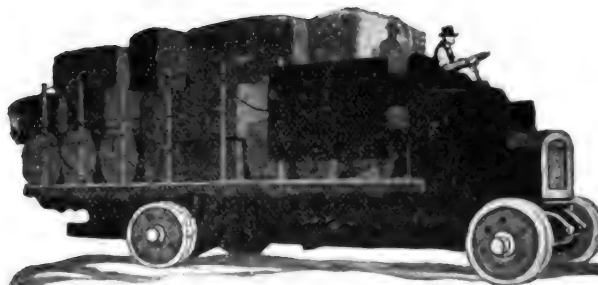
CHARGING STORAGE BATTERIES.

(J. B. J., Morristown, Penn.)

Will you kindly favor me with a diagram showing how I can utilize the electric lighting circuit in my garage for charging the six-volt storage battery of my car. How can one determine which is the negative and which the positive wire of a circuit?

To charge a storage battery it is necessary that a direct current be available. If this is not a device called a rectifier must be used which will transform alternating current into

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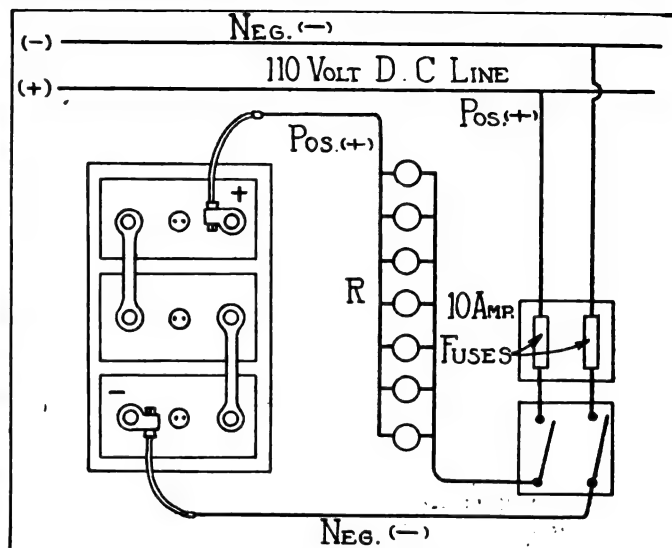
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Wiring Diagram for a Home-Made Storage Battery Charger.

direct current. Having secured the correct current, so to speak, it is next necessary to consider the voltage or pressure of the same. As a common voltage for lighting circuits is 110 volts, the diagram given herewith is on this basis. Before going much further it is necessary to know the polarity of the circuit, or rather, which is the negative (—) and which is the positive (+) wire. A simple way to do this is to mix in a vessel some salt and water in the proportion of about a tablespoonful of salt to a tumbler of water. Taking the wires by the insulation, so as not to get a shock, dip the bare ends into this mixture in the vessel, keeping them at least an inch apart. Immediately fine bubbles of a gas will be seen to be given off one wire. This is the negative (—) wire. Connect up through a resistance (R) made up of carbon filament lamps (use seven 110 volt, 32 candlepower, 100-watt carbon lamps, or 28 110 volt, 25-watt carbon filament lamps), as shown, making sure that the positive wire of the circuit is connected to the positive terminal of the battery. This will probably be found stamped "+," or maybe it will be painted red. Install in the circuit a double pole single throw switch to start and stop the current flow. The battery charge is complete when, with all the cells gassing evenly and freely at the charging finish rate (as given on the battery plate), the gravity of the solution in all the cells shows no further increase during one hour. This is determined of course by means of a hydrometer, an instrument which should always be handy where there are batteries to be tested or worked upon. The reading for charged cells should be from 1275 to 1300. By voltmeter the battery should show from six to eight volts when fully charged. Any battery maker will gladly furnish a booklet giving complete diagrams for wiring and instructions for procedure in charging batteries. The diagram herewith is given for what it may be worth to you or other interested readers in lieu of more detailed information.

SECOND HAND FOREIGN TIRES.

(J. H. H., Northampton, Mass.)

I recently bought a second hand tire, but there is no name on it nor any size, but on one of the side walls is printed 875x105. The shoe is a good bargain for the money and it seems to fit my rim all right. I use regularly a 34x4 tire. Will you advise if you think it would be all right to keep it? I mean would there be any danger of its not being the right size.

If the shoe fits your rim satisfactorily it will probably give you good service. From the figures given it is very likely that it is a foreign tire, but that does not necessarily mean that it was made outside of this country. Those figures are the metric sizes for the tire that is about the size of the American size, 34x4. Some of our manufacturers designate tires by that system for foreign trade. The size you state is on the tires, viz., 875x105, is accurately in inches 34.44882x4.12385. Our American size 34x4 in that system would be about 863.6x

101.6 millimeters. It is quite likely that because of being somewhat undersize for the metric system standard it was made a "second."

MOTOR KNOCKS SLIGHTLY.

(M. D. S., Canton, O.)

At times my motor makes a slight knock which seems to come from some part of the cylinders. Can you tell me what this might be?

Knocking in a motor may come from a variety of causes. It usually means a loosened bearing, which must be located and remedied immediately or trouble will follow. It may be due to carbon forming in the head of the engine, an overheated engine, or spark advanced too far. When you notice such a knock retard the spark and note if the noise stops. Then determine if the motor is overheated. If it steams at the radiator, or runs after the switch is thrown "off," it is overheated or is being fired by glowing carbon. Remove spark plug and see if it is carbonized badly. If so, have the carbon removed by burning out or scraping. If the knocking still continues it may be due to piston slap, but this is usually in old engines. As piston comes to top on compression stroke it leans to the right hand side of the cylinder. As it goes down on power stroke it leans to the left. If the piston is badly worn it strikes a blow as it goes over centre. For this condition there is no remedy except to rebore the cylinders and fit new oversize pistons and rings. Sometimes it is caused by the valve tappets being out of adjustment. Quite often a skilled mechanic will hunt diligently a long time before finding the trouble.

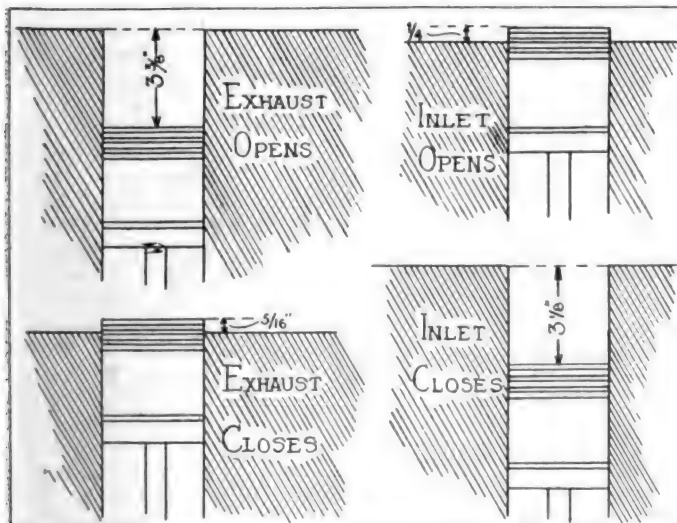
SETTING VALVES OF A FORD.

(G. A. C., Orange, N. J.)

Please publish in the columns of your valuable journal the proper setting of the valves in the Ford and show how these can be set without having to take down the motor to get at the camshaft. Also will you favor with the valve timing of the Peugeot that Aitken won the Astor Cup race with?

Referring to the accompanying illustration, you will see approximately how to set the valves for the model "T" Ford. This is with the detachable head removed and by means of a steel scale. As shown, the exhaust valve should open $5/16$ inch before bottom centre and close at top centre. The inlet valve should open $1/16$ inch after top centre and close $3/16$ after bottom centre.

Regarding the timing of Aitken's racing Peugeot we present a set of figures that is typical of all racing motors. No set timing can be stated for such motors because what might work well on one would not give necessarily good results on another, as it depends upon the peculiarities of each individual engine what the best timing is. In the racing motor diagram shown, in which the inlet is open 225 degrees, com-



Timing Valve of Model T Ford.

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THE MOTOR TRUCK,
PUBLISHED MONTHLY AT PAWTUCKET, R. I.
For Oct. 1, 1916.

State of Rhode Island, County of Providence.

Before me, a Notary Public, in and for the state and county aforesaid, personally appeared William H. Black, who, having been duly sworn according to law, deposes and says that he is one of the owners of The Motor Truck, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of Aug. 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are:

PUBLISHER, W. H. & D. O. Black, Jr., Pawtucket, R. I.
EDITOR, W. W. Scott, Pawtucket, R. I.
MANAGING EDITOR, W. R. Bickford, Pawtucket, R. I.
BUSINESS MANAGER, W. H. Black, Pawtucket, R. I.

2. That the owners are:

W. H. BLACK, Pawtucket, R. I.
D. O. BLACK, JR., Pawtucket, R. I.

3. That the known bondholders, mortgagees and other security holders owning or holding one per cent. or more of total amount of bonds, mortgages or other securities are:

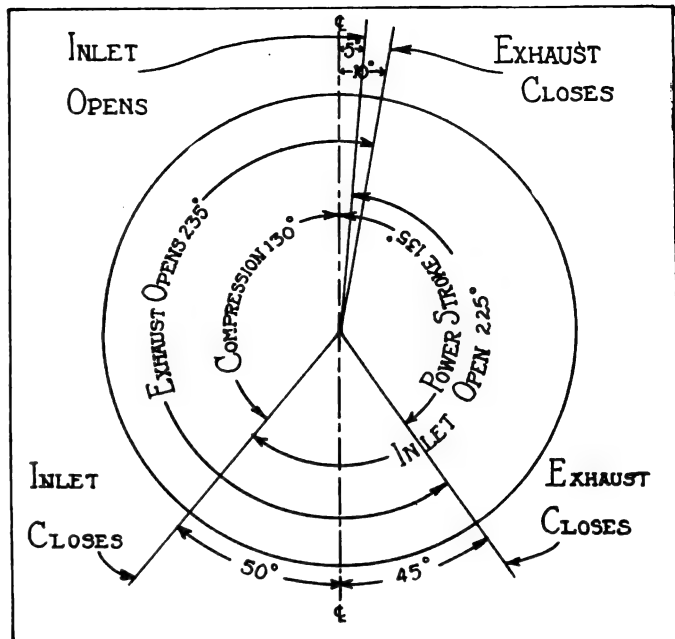
M. J. BLACK, Mortgagee, Pawtucket, R. I.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

(Signed) WILLIAM H. BLACK, Co-Partner.

Sworn to and subscribed before me this 13th day of Oct., 1916.

(Signed) THOMAS BESWICK, Notary Public.
[Seal] (My commission expires June 30, 1917.)



Typical Racing Motor Timing Chart.

pression takes place during the 130 degrees, power stroke covers 135 degrees and the exhaust is open 235 degrees.

CLUTCH NEEDS NEW FACING.

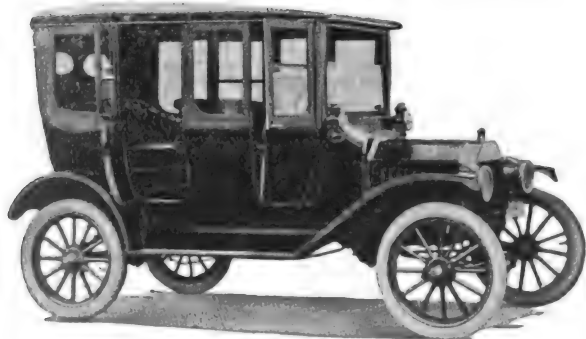
(H. R. O., Seekonk, Mass.)

I have a 1908 Selden touring car on which the clutch has been causing me much trouble by grabbing and starting the car with a jerk. It is a leather faced cone clutch. I tightened the leather on the clutch with new rivets, heads well countersunk, cleaned off all grease with kerosene and then soaked the leather with neatsfoot oil. I have put neatsfoot oil on the clutch and let it stand for two days; the first time I start it is all right, but the next time is as bad as ever. The clutch does not slip at all and the leather engages with the flywheel on all of its surface. If you can tell me the trouble it would be very much appreciated.

The trouble is probably that the leather has become hard and is no longer permanently susceptible to the softening effects of castor neatsfoot oil. As it will do no harm, we would suggest that you try softening the leather by soaking in kerosene oil. This often does the work, although not regularly recommended. It cleans off all grease, etc., and soaks in quickly. It also has the advantage of not gumming up or collecting grim and dirt, while its lubricating qualities are such that it will not appreciably affect the friction between clutch facing and flywheel. If this method does not prove satisfactory, put on a new leather facing.

The best material to use is a good oak bark tanned sole leather or belting. This possesses the required amount of elasticity, durability and pliancy, as well as the required degree of frictional adhesion. For a pattern from which to cut this you can use the old facing or you can use a new pattern made as per the accompanying sketch. Referring to this: Draw a line A-B, representing the centre of the clutch hub. Near the left end of this draw at right angles to A-B two lines a distance apart equal to the thickness of the clutch body or spider. Have these lines extend either side of line A-B equal to the radius of small and large circles of the cone which they represent. This will be clear to you from the sketch. Extend the cone angle until the lines meet at point B. With this point as a centre describe arcs with B-C and B-D as a radius. On these arcs lay off the distances E-G and F-H equal to the lengths of the circumferences of the edges of the cone. Now cut out the piece along the lines E-F, F-H, H-G, G-E, and you will have the pattern for your clutch facing. Perhaps it would be wise to allow a little extra on one of the short faces to allow for fitting on account of inaccuracies which are unavoidable when cutting by hand.

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In putting this facing on lay it on smooth and tight and clamp one end tightly with a clamp and rivet it in place, countersinking the heads well. Then clamp the facing in place a little further on, tightly stretched, and then rivet this and so on. This is better than trying to have it all in place when riveting. Before the leather is put on you should have it soft and pliable and if it is not naturally so it must be made so by soaking in oil. This is recommended before putting it on. Some advise wet application; i. e., soaking the leather in water and putting it on the cone and then when it dries it will contract and be a snug tight fit. While that may be true, it is our opinion that it is likely that the rivets may be pulled away or the facing torn by such a means. Then there are those that advise putting the leather on dry and then soaking with oil, but this sometimes causes the leather to expand and become bunched between the rivets.

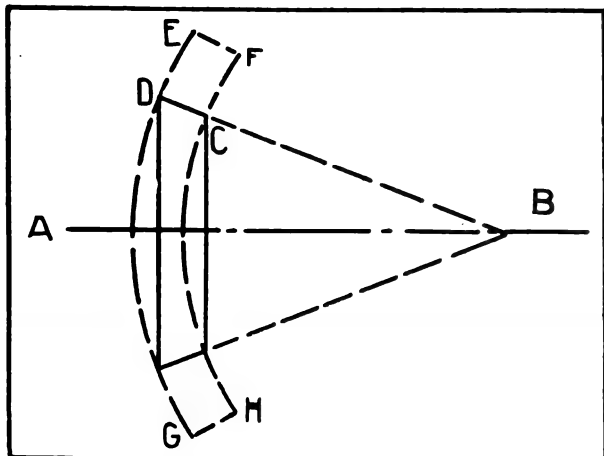
CONCERNING THE MUFFLER.

Judging by the number of communications received of late, it is apparent that there is doubt in the minds of several of our readers as to whether or not the modern muffler is so designed that it can efficiently handle the exhaust gases. The opinion prevails that the muffler is satisfactory for slow city driving, but should power and speed be desired when driving through the rural districts, it is only possible to obtain it by opening the muffler cut out. The reason for this assumption is that the early type of muffler was poorly designed and at medium and high speeds there was a tendency for the exhaust charges to back up and thus greatly tax the strength of the motor to force them out through the muffler. This condition is termed back pressure.

It is apparent that the car manufacturers recognized this condition, as they invariably fitted exhaust cut outs at some point in the exhaust manifold between the muffler and the motor. The opening of the cut out presented an unobstructed exit for the exhaust gases. The majority of modern cars are not fitted with the muffler cut out because the modern design of muffler is wholly capable of handling the exhaust gases.

Anybody who has ever visited a race track and heard the thunderous sounds created by the exhausts of the racing cars will readily understand why the muffler is necessary for street use. The first built cars were not equipped with a muffler and it cannot be gainsaid that automobiles became a nuisance as they increased in number. Laws were passed to the effect that a muffler should be fitted to each automobile. At first the law did not specify that the cut out should not be used and so the fitting of the muffler did not bring much relief so long as the use of the cut out was permitted. Today nearly every city has laws prohibiting the use of muffler cut outs. These laws are being strictly enforced and in many cities classes have been held for the traffic policemen so they will be able to distinguish a cut out exhaust and a muffled exhaust.

Of course, there are numerous types of mufflers, but their sole purpose is to momentarily store the exhaust gases, allowing them to expand and then silently leak out.



Method of Making Pattern for Cutting Cone Clutch Facing.

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 neapolis, Salt Lake City, Seattle, Peoria.



The muffler is generally located underneath the car and in such a position that it is not easily reached. For this reason it is usually forgotten by the motorist from year to year. This should not be permitted, as even the best designed muffler is apt to cause back pressure if it is not afforded proper care. There are many openings and chambers which in time may become clogged with carbon and soot from the exhaust gases. The rapidity of accumulation depends upon conditions in the motor. If a poor grade of oil, superfluous oil, or leaky piston rings are being used, the clogging action will be much hastened.

Another practise which materially assists in clogging the fine passages is the loosening of carbon deposits in the cylinders by chemical action and then expelling the loosened particles along with the exhaust. Many of these particles cannot force their way out of the muffler and consequently accumulate there. A few of the more experienced operators understand this condition and generally when removing carbon by this method open the cut out.

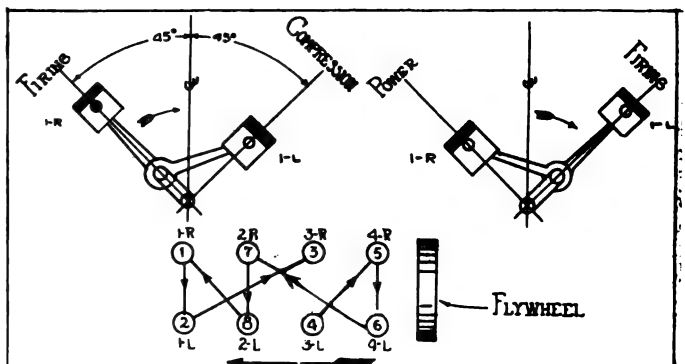
It is not difficult to disassemble the muffler and clean the chambers. The benefit derived thereby will well repay the time spent. It is well to clean the muffler at least once a year and then once a month lightly tap the outside walls with a wooden mallet so that the incrustations will be loosened and blown out with the exhaust gases. If proper care is afforded the muffler it will efficiently handle the exhaust gases from the modern pleasure car engine without necessitating the use of the muffler cut out.

EIGHT-CYLINDER FIRING ORDER.

(G. L. P., Miami, Fla.)

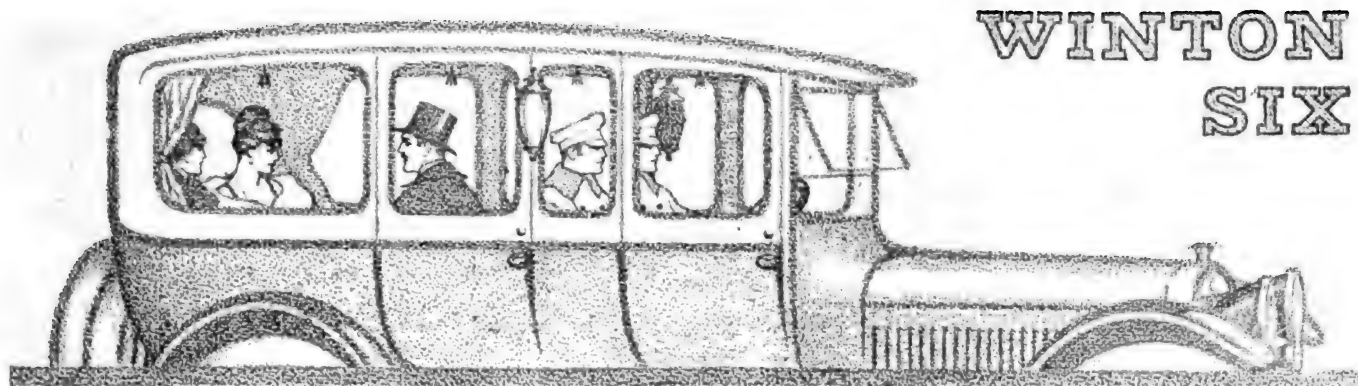
I understand that in some eight-cylinder motors the firing order is first the front two; second, the third two; third, the fourth two, and fourth, the second two. Will you kindly advise if this is correct and in what motor is such an arrangement of firing order used. Also can you state what particular reason there is for having this order?

In some models of the Ferro motors this firing order is used. The accompanying sketch shows clearly this arrangement. Regarding this matter the Ferro Machine and Foundry Company says that this is "because two successive impulses acting on one crank pin have substantially the effect of a prolonged impulse with its average thrust in a vertical line and since all crankshaft and crank pin bearings are, or should be, split in a horizontal plane, it is obvious that the thrust should be as nearly as possible at right angles to the plane of the split. * * * Consider the not uncommon improper use of spark advance with the different firing orders. With the firing order used in the Ferro eight * * * assume that the spark is advanced too far and that No. 1 left fires too early following the firing of No. 1 right, it is at once apparent that this will set up no crankshaft strains whatsoever and will result in an abnormal downward increase on No. 1 crank pin bearing, but if No. 4 left followed No. 1 right, a too early ignition means an opposed torque tendency at the two ends of the crankshaft, which will be repeated, but in the opposite direction when No. 4 right fires, followed by No. 1 left. To sum it up, the firing order used in the Ferro eight has the effect in stresses of a four-cylinder engine of the same power, but with the impulse so prolonged that the maximum pressure is only half as great.



Firing Order of Ferro Eight-Cylinder Motor.

(When Writing to Advertisers, Please Mention The Automobile Journal.)



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When friends accept your invitation, omit apologies for the car you drive. Apology cures no faults and wins no esteem. Happiness comes from owning a car that needs no defense, no “whitewashing”

OWN an appropriate car. In winter that means a *closed* car. For the successful man or woman it means a closed car of *best merit*. To those accustomed to unhampered living it means a closed car of *exclusive distinction* not a copy of any other car in town, but one of unmistakable charm and individuality—a car designed to your own personal taste in body style, finishing fabrics, color harmony, and appointments. Such a car requires no apology. Instead you are every day rewarded with the approval of your friends, with the approval of every passerby who has eyes to see.

In making your car, we enjoy creating a beauty that will exactly meet your desire. We fashion your car to your ideal. It becomes a splendid personal possession, a car that is a delight wherever and whenever it appears.

By specializing for many years on distinctive cars for private ownership, we have achieved in the Winton plant an art beyond imitation, an art that adds zest to the use of your Winton Six. That art is at your service. Simply write or telephone.

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Prices range
as low
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Entered as second class matter, April 15, 1906, at the Postoffice at Pawtucket, R. I., under act of Congress of March 3, 1879.

Ten Cents
a Copy

THE Safety First propaganda is gathering advocates and practitioners every day. During the past month several of the leading railroads of the country have redoubled their efforts to reduce the death toll at railroad crossings and motoring organizations, national, state and local, are making more strenuous efforts to add to the safety of the highways. Such efforts are needed, and too many individuals and organizations cannot "get into line" too soon, as is shown by the estimate produced by one of the country's leading authorities in accident insurance, whom everyone will concede is in a position to know whereof he speaks.

THE Estimated Number of deaths during 1916, due to automobiles, is placed at the ghastly total of 5200. The same authority is responsible for the statement that during a period of five years, from 1911 to 1915, the ratio of automobile fatalities has increased from 23.9 per million inhabitants to 59.3. California reports for the three summer months of this year a total of 1103 accidents due to automobiles, in which 258 persons were killed instantly or later died of their injuries. No doubt some of the other states can show even a more frightful toll.

THE Responsibility rests in varying degree with all users of the highways. But it has been said by the American Automobile Association officials that the drivers of motor cars are liable for not more than five per cent. of the accidents, while in about three per cent. of the cases both parties to the accident are equally responsible. Whether the estimates are correct or not need not be a point of contention. The quickest way to bring down the death rate is first to work toward that end and talk afterward.

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Treasurer - - WILLIAM H. BLACK
Secretary - - - - D. O. BLACK, JR.

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25th of each month by the
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Times Building, Pawtucket, R. I.

IT SHOULD Be the ambition of every driver and every pedestrian to reduce the death rate to its absolute minimum. Generally speaking, it needs only the exercise of common sense and care at all times. Each driver should take pains to observe the laws religiously; he should practise keeping to the right, sounding the horn when approaching (not passing) street intersections and curves, carefully watching pedestrians on the street and sidewalks until safely past, and making absolutely certain that the road is clear before attempting to pass ahead of another vehicle. Another necessity is to govern the speed of the car to meet the requirements of the varying phases of traffic.

MOTOR Car Tourists have been much too prone to regard Florida as a land of impassable jungles and sandy wastes, and for that reason have failed to take advantage of the state's great attractions as a motor car touring ground. The leading article of this issue endeavors to point out characteristics of the "peninsula state" that should attract the lovers of scenic grandeur and historical land marks. Florida is also a mecca for sportsmen, her rivers, lakes and seas abounding with big game fish, while her forests are the homes of many strange animals.

ANOTHER Feature Article is about changeable winter tops, a subject close to the hearts of every motor car owner. The tops described and illustrated are all worthy of consideration by those readers who desire to equip their open cars for winter service. Limitations of space prevent going more deeply into details in this issue, but there is sufficient information to enable one to determine the value of each. Complete details can be obtained from the manufacturers.

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are unequalled for motor lubrication, freer from carbon, economical because they protect the motor against mechanical wear, and the quantity required is comparatively small.

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—OF—

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THE 100% PERFECT SPOTLIGHT

More than a spotlight? Yes!

Years ahead in improvements? Yes!
It anticipates the law.

The NITROJECTOR No. 100 is the only light offering absolute surety that the driver is within the law. And it is fully covered with Patent Protection.

In fact, the OLD SOL NITROJECTOR has revolutionized present ideas of "lighting the way" and provides so many new and necessary features for the motorist that every car owner in the country will take advantage of this wonderful light.

The OLD SOL NITROJECTOR has at least ten exclusive features that cannot be found in combination in any other motor car lighting device in the market.

OLD SOL SPOTLIGHTS

No. 70. Always a big seller. Many special features over all other spotlights. Price \$7.00.

No. 77. Just right for the smaller car with the exclusive features of No. 70. Price \$5.00.

No. 1 It is the only light in the world with a cylindrical double shutter. This exclusive OLD SOL device, in combination with the Universal Bracket, gives instant and perfect control of the light at any height or distance.

No. 2 There are three silvered reflector surfaces. The light does not spring out in a glare from a parabola reflector but is caught on a spherical door reflector thrown back again on a spherical body reflector and then is brilliantly spotted or diffused by means of the OLD SOL focusing device, and a rim parallel beam reflector.

No. 3 The OLD SOL NITROJECTOR has an original and exclusive focus device which can be instantly adjusted for a spot or diffused light at any height upon the road to meet the law.

No. 4 Each NITROJECTOR No. 100 is equipped with a large four inch diminishing mirror. This safety device is absolutely rigid yet adjustable by a touch of the finger. An exclusive equipment and patented.

No. 5 The OLD SOL NITROJECTOR universal bracket is the only bracket on any light that will fit the tapered windshield. This bracket is a standard specification for every car except the Studebaker for which a special bracket will be supplied, when specified, at no extra cost.

No. 6 With each OLD SOL NITROJECTOR five feet of Electric Duplex Braided Cable is supplied. Only the best quality of insulation is used on this cable. Each section is provided with copper terminals at the four ends furnishing a quick means of installation.

No. 7 OLD SOL NITROJECTOR is the only spotlight on the market that has twin (central and pilot) bulbs. The pilot light bulb provides for a secondary illumination of less candle power than the main bulb, and confines the light to a generally downward direction as required in many city ordinances and state laws.

No. 8 OLD SOL NITROJECTOR switch is an integral part of the focusing device and the operating handle. All parts of focus device are scientifically insulated. Patented cork protector against moisture and dust in switch.

No. 9 Other exclusive OLD SOL features are the "on" and "off" control on the end of the handle—as simple and convenient as an electric light switch and the focusing device and switch that "spots" or "diffuses" the light far into the distance ahead.

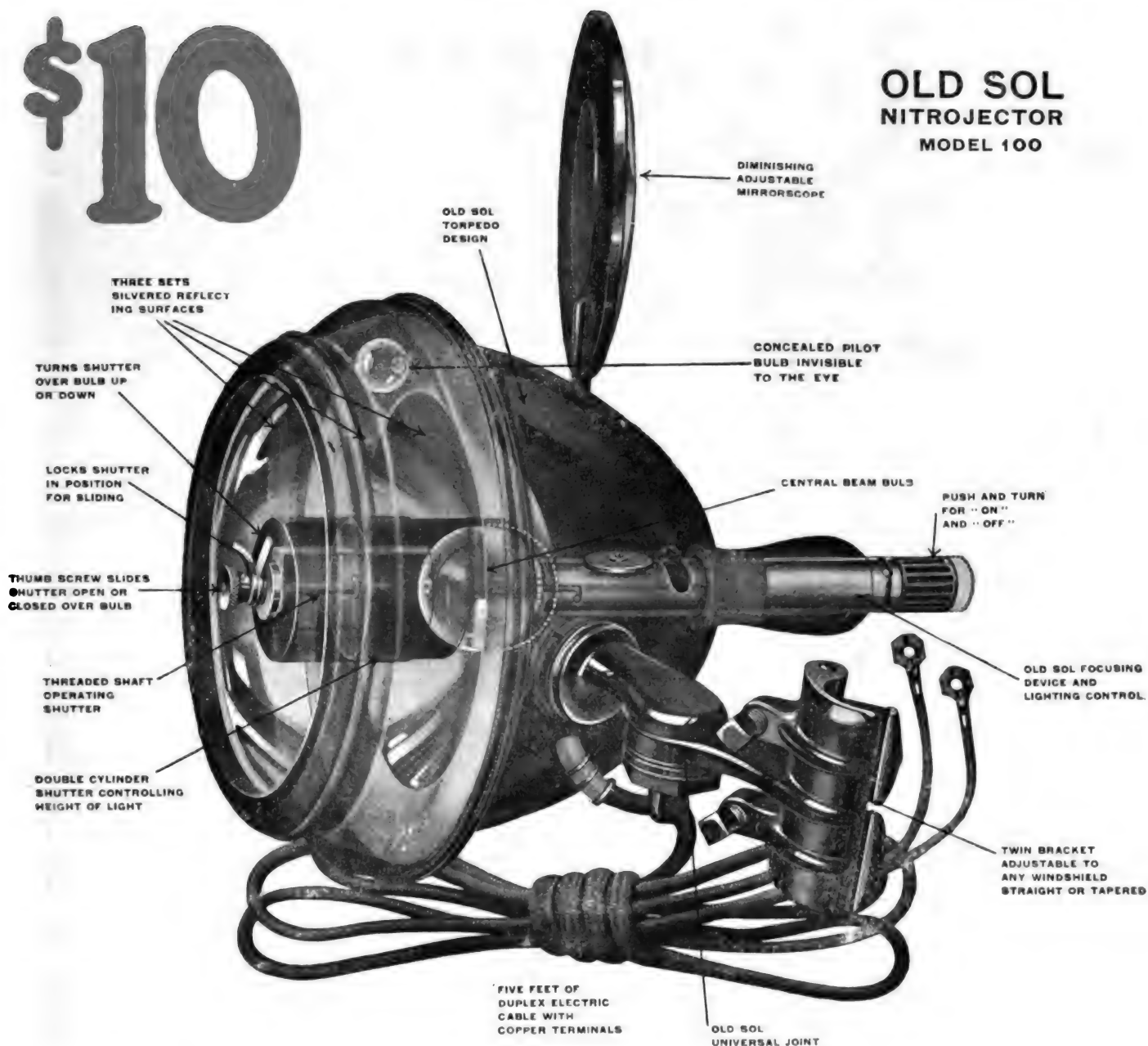
No. 10 The exclusive torpedo design—a shape that beautifies the superiorities of OLD SOL NITROJECTOR making this the most handsome and efficient light given to the Public.

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Ten Exclusive Features

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**OLD SOL
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MODEL 100**



DEALERS—OLD SOL NITROJECTOR will revolutionize your business in spotlights. It is years ahead of any light upon the market. Its advantages will be the talk of motorists throughout the country. The fastest selling accessory ever marketed. Get in touch with your jobber at once and arrange for your first

shipment. Every car owner in your community will buy one once he knows about it.

JOBBERs—If you are not already in a position to take care of your trade "get there" immediately. Write or wire us at once. Deliveries of Model 100 NITROJECTOR commence January first. Send for contract.

Canadian Price: Model 100—\$15.00

HAWTHORNE MANUFACTURING CO., INC.

BRIDGEPORT, CONNECTICUT, U.S.A.

Makers of Old Sol Windshield Spotlights and electric lighting devices.

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From the Dealer's Standpoint This Reo Line Surely is Ideal

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NOR CAN YOU consistently talk two different policies or two makes of cars. Or if you can, still you can't convince the buyer of your sincerity.

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THE MOST SUCCESSFUL automobile dealers are those who have for several years handled one make of car exclusively—even when that car was made only in one model.

BUT YOU SAY you want more than one model—more than one price class. Can't blame you.

AND YOU WANT something to sell in January as well as in June—a good line of Motor Trucks.

WELL LOOK OVER this line of Reos and see if here isn't a variety made to your own order.

AND EVERY ONE, pleasure cars and trucks alike, of Reo quality—"The Gold Standard of Values."

NO, WE DO NOT need any more dealers just now. Can't supply the needs of those we have—as you know.

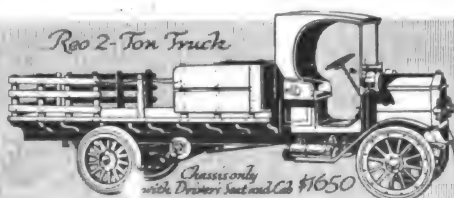
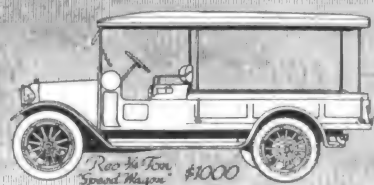
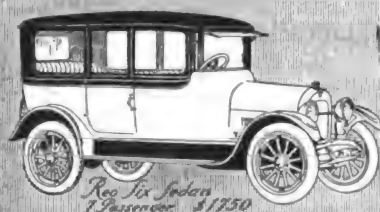
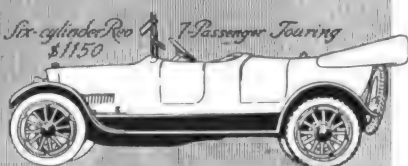
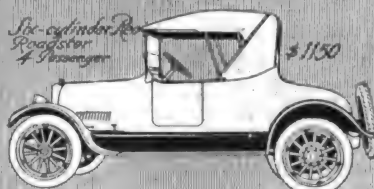
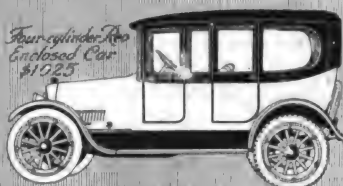
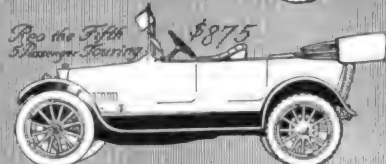
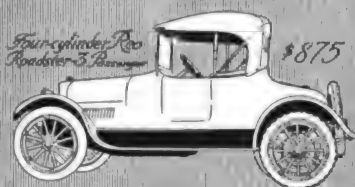
THAT ISN'T THE IDEA at all.

WE REO FOLK BELIEVE in looking ahead—a long way ahead. Keep up the momentum. Spread the prosperity over the years.

THERE MAY COME A TIME when we'll be ready to change in your territory or want a better representative in another. Keep in touch.

Reo Motor Car Company
Lansing, Michigan

171-A



All Prices are duty paid f.o.b. Lansing, Michigan.

"THE
GOLD STANDARD
OF VALUES"

(When Writing to Advertisers, Please Mention The Automobile Journal.)

The Automobile Journal

VOL. XLII.

NOVEMBER 10, 1916.

NO. 7.



Motor Road Through a Jungle Outside of Daytona, One of the Favorite Resorts for Tourists.

Florida, the Magic Realm for Motor Tourists.

When Cold Weather Discourages Motorists from Visiting the Historic Shrines and Scenic Grandeur of the Northern States, They Can Find a Land Enshrouded in Romance and Tropical Langour in the Great State of Florida.

SINCE the "See America First" propaganda has been in force during recent years scribes and spokesmen have not given Florida its proper share of attention. Countless panegyrics have promulgated in behalf of other states and sections of this great United States of ours, while the lures of the great peninsula state, "pointing its finger toward the southern cross," has been somewhat neglected:

During winter months motorists of the northern tier of states can find no more fascinating land under the Stars and Stripes than exists in the land of Ponce de Leon. It is a magic realm wherein flourishes an exotic climate and lurid

flora contends with strange and striking fauna. The breezes of perpetual summer stir the foliage of cocoanut, orange and grapefruit trees, carrying their penetrating scents far across the land. On every hand one sees landscapes red with poinsettia, while the red and yellow of the hibiscus break the monotony of Florida's sandy surface.

The Spanish in Florida.

Here one finds a southern California without overhanging snow-crested mountain peaks. It is unlike anything that the motorist of the North is accustomed to finding in his neighborhood, and everywhere there is evidence of the Spanish

influence that first held sway in the peninsula state.

Historically considered, Florida stands in the fore ranks of the country and nation. There is scarcely a city or town that has not some memory stirring landmark to show the stranger. And as a mecca for hunters and fishermen, this quaint state has attractions among her thousands of lakes, far-flung sea coast and boundless primeval forests and jungles that cannot be equaled elsewhere within the confines of the United States.

Florida is at its best for motorists from the north land from December to the end of the winter months, as they are known in New England. The social season,



Typical Southern Home In St. Augustine.

which is a big feature of Florida life, begins after the Christmas holidays and continues until late March.

The method of travel through this great state today is in sharp contrast to that employed by Hernando de Sota when he made his memorable explorations through its vastness centuries ago, fighting Indians part of the time and suffering severe hardships all the time. A good, and in some places, excellent highway system takes the motor car tourist from the northern part of the state down either the east or west coast through a scenic splendor that would lead one to believe he were in Central America rather than in one of the United States. Almost without interruption the tourist is flanked by dense forests of palms and slender pines from which droop festoons of gray vines and creepers. The wonderful sunsets one can witness nearly every evening, sunsets that are masterpieces of soft delft blue and salmon pink, in which lacy clouds float lazily, bespeak a land of romance and are comparable to the far-famed evening scenes along the Mediterranean.

A 500-Mile Beach.

The east coast on the Atlantic is practically one continuous sandy beach, backed up by fringes of palms for a distance of nearly 500 miles, broken occasionally by bays and broad estuaries in which palm bedecked islands loom like emeralds. It is along this coast that the world famous watering places have their locations and palatial hotels and residences face thronging bathing beaches. In late years Florida has drawn an increasingly large number of winter tourists, and today rivals California in that respect. Its 1000 miles of sea coast, warmed by the tepid waters of the Gulf stream, and its semi-tropical location, places it among the world's winter play grounds.

Many Main Routes Enter Florida.

There are several main routes of automobile travel that lead into Florida from the north and west over which tourists may motor from the various points along the Atlantic seaboard, the Middle West or the Gulf states. One main route,

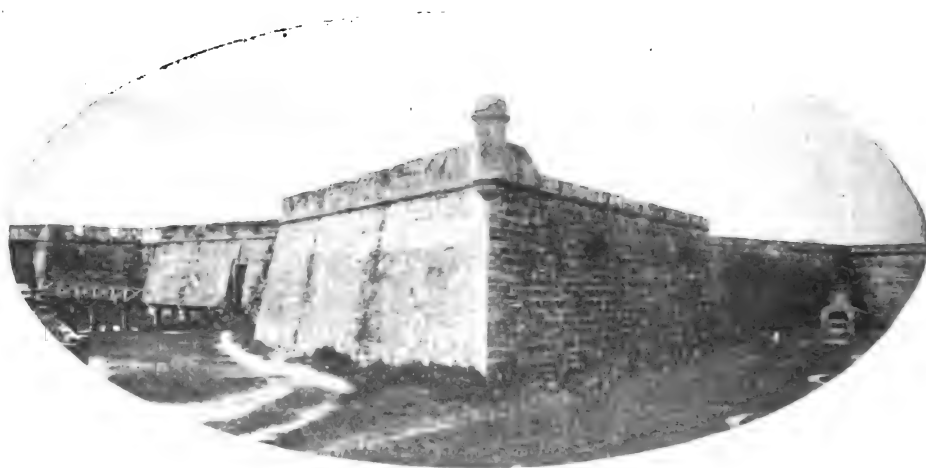
known as the Atlantic Coast Highway, runs from Calais, Me., through Boston, Providence, New York, Philadelphia, Baltimore, Washington, Richmond, Raleigh, Rockingham, Columbia, Augusta, Savannah and into Jacksonville, thence along the coast of Florida to Miami. Most of the routes shown in the accompanying map constitute part of the great Dixie Highway system, which connects with the Central

States and Michigan via three routes, all converging at Macon, Ga. One of these runs from that city to Tallahassee; another to Jacksonville, through Fitzgerald and Waycross, Ga., and the third through Savannah into Jacksonville. From the west several routes lead into the state from Alabama on the western and northern boundaries, passing through both Pensacola and Tallahassee.

In the accompanying itinerary a circuit about the state is given, but as shown by the map there are a number of cross routes which can be taken to vary the trip. The roads covered in the itinerary, however, are in fairly good condition, especially that stretch from Jacksonville to Miami along the coast, but the route shown from Miami to Marco across the Everglades cannot be traveled, being but partly laid out. When finished, however, if the present plans are carried out, this highway will be one of the finest boulevards in the world,



A Beautiful Vista Along Date Palm Avenue, Daytona,



Historic Old Fort Marion, Near St. Augustine.

stretching 70 miles across the Everglades from Miami to Marco, and for about 30 miles without a curve. It is being built of the material thrown up from a drainage canal that is being constructed along the route and when completed will be treated with asphalt. Rows of palm trees are to be planted on either side for the entire distance between the two cities.

Point of Entry Determines Route.

The point of entry into the state would probably determine a tourist's decision as to whether to go down the west coast route and come up on the east coast through the watering resorts, but either direction can be followed, as there is a road connecting Tallahassee with Jacksonville. At present the turn across the state from one side to the other is made over a road leading from Jupiter on the east coast through Okechobee City to Arcadia, where a number of the western thoroughfares converge.

From Tallahassee around the state

back to the starting point is about 1200 miles. The tour can be made in a week, but for the tourist who has the time he could spend a month in the numerous places of historic and scenic interest. Every minute could be employed in witnessing novel scenes or in participating in the many forms of sports that have made the Florida beach resorts famous.

Few states have entered so strongly into the spirit



One of Florida's Most Beautiful Estates.

of the good roads movement and have so quickly awakened to the inestimable benefits to be derived from an extensive system of excellent highways which not only aid the agricultural development of the state, but also attract thousands of tourists with money. These tourists not only patronize the hotels, garages and resorts in the state, but also find good opportunities for investing in property where the conveniences and improvements show a progressive spirit.

A total of over \$3,000,000 has already been appropriated in different counties for the construction of the Dixie Highway roads alone. Portions of highway extending along the east coast between Miami and Jacksonville, which were only improved on short stretches, were about all the state could boast of in the way of good touring thoroughfares until the Dixie Highway movement was enthusiastically taken up.

Roads Being Improved Rapidly.

The sum of \$1,500,000 has been spent on the highway running along the east coast, and it is now an ideal road for several hundred miles. The work in the western sections is rapidly progressing, as is also the movement in the northern part between Tallahassee and Jacksonville. On this latter stretch, which was formerly an almost impassable trail of soft sand, a large percentage of the route has already been made into a hard surfaced highway and it is expected that the entire distance will have been so treated at an early date next year. Taylor county has voted a \$600,000 bond issue for a brick or asphalt road between Tallahassee and Gainesville and this work is already nearing completion. Polk county has voted \$1,500,000 for improving the roads and all the other counties in the western section of the state have joined in the movement for a chain of roads leading north and south that will be the equal of the fine thoroughfare on the east coast, which has accomplished so much in popularizing that section.

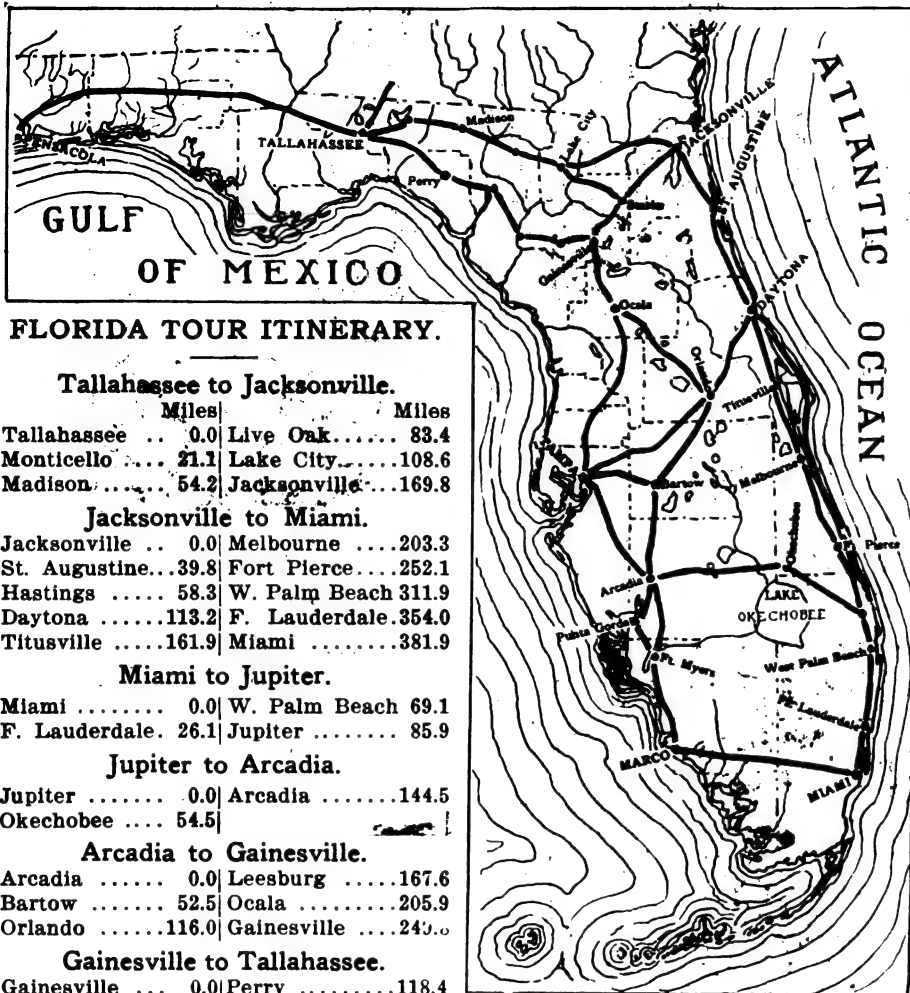
Jacksonville is the fountain head of activity and travel in Florida. It is the head of the good roads system. In the



One of the Famous Drives Near That Popular Resort.



Aged Fort Matanzas, Near St. Augustine.



contiguous territory are land marks, reminiscent of the bloody wars fought on the state's soil, some dating back to the period before the English had established their hold on more northern sections. Between Jacksonville and Live

Oak is the battlefield of Olustee, where the Confederates and Union soldiers fought one of the fiercest battles of the Civil War.

Down the east coast many excellent stretches of good roads lead the motorist to the best of Florida's attractions: St. Augustine, the patriarch of American cities and one of the quaintest in the United States; Daytona, a thriving mu-



Building Tamiami Trail.

nicipality and possessing one of the finest natural racing courses in the world, on which Bob Burman and Barney Oldfield made their history-making races; Palm Beach, famed throughout the world as a watering place; the bay of San Luis, in which all the battle navies of the world could ride safely at anchor, and further south stands Miami, the home of many of America's richest citizens.

Pre-Historic Race in Florida.

Should the tourist cross the state from Miami to Marco he would follow the Tamiami trail, which has been described in the foregoing. Here only the other day geologists revealed the antiquity of Florida, unearthing the human remains of a race of people who are said to have lived there in a period estimated to be from 10,000 to 20,000 years ago.

The itinerary given with this tour takes the tourist from Miami back to Jupiter and then westward to Arcadia through the great central lake region of Florida than which there is no more interesting section in this country. He will also find himself on the west coast in Florida's rightly famous citrus fruit district. Northward is Tampa, one of the most enterprising metropolises in the state. Tampa claims that a greater mileage of good roads radiate from that city than any other centre in Florida. From here the route leads back to Tallahassee, the end of the tour.



The Beautiful Entrance to Miami, Florida, the Southern End of the Dixie Highway.



John Aitken, Leading for Season's Championship, and His Peugeot Car and Mechanician, Maurice Becker.

Aitken Repeats at New York.

Nearly Breaks World's Record for 100 Miles and Does Establish Record for a Board Track.

AS A RACE against time the Harkness Trophy contest at Sheephead Bay Speedway, Oct. 30, was a conspicuous success; from the point of attendance it must be ranked as a failure. In the first instance Johnny Aitken, the winner, almost broke the world's record for 100 miles, made on the English track at Brooklands some years ago, established his claim for the champion of the 1916 season, made a new record for the distance on a board track and won \$4000 in prize money. In the second instance, though the day was perfect for such a contest, there was not more than 5000 persons in the big stand.

The race quickly developed into a two-man affair, it lying between Aitken and Resta, both driving Peugeots. For the first 30 miles these two whirled around the track at a speed approximating 109 miles an hour. At one time Aitken reached the peak at the rate of 109.6 miles. Due to stops for tire changes by both these drivers in the first 30 miles, the speed was lowered to about 106 miles per hour, and when Resta went out in the 64th mile with a broken crankshaft, Aitken felt content to hold the rate in order not to overstress his thundering machine.

He finished an easy winner, covering the distance of 100 miles in 56 minutes and 37.65 seconds, an average of 105.95 miles per hour. Galvin in a Premier came in second in 56 minutes and 45.35 seconds; Wilcox in a Peugeot, third, in 57 minutes, 10.53 seconds; Henderson, in his Maxwell, fourth, in 59 minutes and 4.70 seconds, while Devore, driving a Duesenberg, finished fifth in 59 minutes and 5.47 seconds. Twenty-two drivers faced the starter.

Aitken's Peugeot car was equipped with a Miller carburetor, K. L. G. spark plugs, Bosch magneto, Goodyear cord tires, Hartford shock absorbers and Rudge-Whitworth wire wheels, and he used Oilsum as a lubricant.

The consolation race of 50 miles, which

was for the benefit of those that did not finish in the money in the premier event, was begun by 11 cars and was won by LeCain in a Delage at an average rate of 104.2 miles per hour. It was an uneventful contest, it being largely in the nature of a procession from start to finish, with LeCain running away from the rest of the field.

ENCOURAGE TOURISTS TO GO TO CALIFORNIA.

The Tourist Association of Central California has adopted a novel, but attractive idea to encourage eastern motorists to make tours through Central California. From the eastern offices of the association, which are located at New York City and Chicago, representatives will conduct a campaign to interest tourists in the Central Californian territory and as an additional inducement have arranged to have the tourists' cars shipped across the country in car load lots, which will mean a saving of 75 per cent. on carrying charges. This arrangement will also relieve the owners of responsibility, as the association looks after the machines until they are delivered again into the hands of the owners at San Francisco.

N. A. C. C. COUNSEL ARGUES LICENSE CASE.

Charles Thaddeus Terry and Ex-Governor Griggs of New Jersey, counsel for the National Automobile Chamber of Commerce, argued the automobile license case before the Supreme Court recently. The case, which has to do with the constitutionality of the state registration law, is to decide whether the states have the right to raise funds for good roads work under the guise of registration fees and whether they can interfere with in-

terstate traffic and require registration of a motor vehicle which has already complied with the registration laws of its home state.

HEADLIGHT PROBLEM NEARING SOLUTION.

The problem of the glaring headlight and the incident flurry that it has caused in legislative circles, where for a time it was feared there would be hasty and unwise laws enacted, seems to be nearing a quick and happy solution.

Various activities in the S. A. E. and A. A. A., among the automobile manufacturers and lamp manufacturers, have been centred on this question for some time and as a result it is expected that the question will cease to be bothersome after the first of the year. A model bill is being drafted and will be submitted to the various legislative authorities. If they wish to legislate against the headlight glare the bill will regulate the matter in a sane and reasonable manner. On the other hand, the S. A. E. committee has been testing out a number of the devices that are on the market to bring the lights within the new laws.

LONG ISLAND R. R. CHANGES CROSSING PROTECTION.

The Long Island railroad has sent out notices that the devices for protecting motorists at crossings are being changed to comply with the new standards recommended jointly by the American Railway Association and the Public Service Commissioners. The notices contain the following warning that motorists should bear in mind:

"All gates are painted with black and white diagonal stripes, and at night these gates will show a red light.

"The crossing watchmen, during daylight, will hold to view a 16-inch disc with the word 'STOP' painted in large black letters on a white field. At night watchmen will use a red lantern to signify the approach of a train.

"Substantial progress has been made by the Long Island railroad in improving the roadway leading up to the crossings, also in removing obstructions to the view, such as bushes, hedge fences, etc. Although this is not possible in all cases, the safest way to avoid accident is to STOP BEFORE YOU CROSS.

"Automobilists who read this announcement are urged to tell their friends about the change in the methods of protection at grade crossings adopted by the Long Island railroad."

PULLMAN PRICE UP \$85.

The price of the four-cylinder Pullman car, manufactured by the Pullman Motor Car Company of York, Penn., has been advanced to \$825, an increase of \$85. Three body types will be marketed, a two-passenger roadster, four-passenger roadster and a five-passenger touring car. Green will be the standard color finish.

The High Cost of Mud is Proved.

Government Shows How Good Roads Increases Land Values and Aids Children's Education.

Increase of land value, ranging from 25 to 194 per cent. and reduction of hauling costs from 33.5 cents per ton mile to 15.7 cents, due directly to road improvement in eight counties in Virginia, New York, Florida, Mississippi and Alabama, prove conclusively that dirt is not cheap, when that dirt in the form of mud is on highways.

These and a number of other interesting and important factors are presented in a bulletin of about 150 pages just issued by the Department of Agriculture under the title "Economic Surveys of Highway Improvement." The work is an analysis of results obtained from road improvement during a period of five years in four Virginia counties, and one each in the other states mentioned above.

Following improvement of the main market roads, the selling price of tillable lands served by the roads increased from one to three times the total cost of the improvements. The gross annual saving in hauling costs due to the good roads amounts to \$627,409 for a traffic of about 3,500,000 ton miles, while the net saving, after deducting the cost of interest and principal for road work, averages 11.6 cents per ton mile for hauling.

Before the roads were improved the average school attendance was 66 pupils in each 100 enrolled, as compared with 76 after improvement. Thus 10 more children in every 100 are enabled to secure an education as a result of better roads.

MAINE AUTOMOBILE ASSN. TO MEET ON DEC. 14.

The Maine Automobile Association will hold its annual meeting at the Falmouth hotel, Portland, Me., on Dec. 14. A banquet will be given and several speakers will be heard on various subjects, one of which relates to the proposed mill tax law to take the place of the bond issue, which runs out this year. Governor-Elect Milliken has been invited to attend, as will be the entire Maine legislature. Another big dinner will be held in Augusta in January during the session of the state legislature.

A. L. A. PROVIDENCE OFFICE REMOVED.

The Providence, R. I., office of the Automobile Legal Association has been removed from the Grosvenor building to room 903 of the Turks Head building, in the same city. Complete duplicates of all the association's touring information, maps, etc., may be obtained by members at the new office.

George H. Huddy, Jr., vice president

and attorney of the A. L. A., has moved his offices to the Industrial Trust building. Members wishing to secure touring information for the Shenandoah Valley should address their communications to V. J. Kenney, Hotel Du Pont, Wilmington, Del.

ALFONSO ORDERS FOUR MORE WILLYS-KNIGHTS.

Alfonso, King of Spain, through the European headquarters of the Willys-Overland Company, has ordered two Willys-Knight touring models and two limousines. The Spanish monarch seems partial to that make of car, for last spring he ordered a Willys-Knight touring car through his ambassador at Washington. This implied royal indorsement of the car is taken by the Willys-Overland Company as a triumph for American builders of Knight sleeve-valve engines and as an acknowledgment that they are the equals, at least, of the renowned Panhard, Mercedes, Daimler, Minerva and other European Knight motored cars that sell from \$4000 to \$8000.

PAIGE SUPERVISOR CHECKS UP OWNER SERVICE.

The Paige-Detroit Motor Car Company of Detroit has a service supervisor, Robert Evans, who devotes his time to seeing that owners of Paige cars are getting satisfactory service. President Harry M. Jewett, in speaking of this service that is given by the Paige company, says:

It is our aim to make service not only helpful, but also instantly available as far as possible. We believe that it is not only well to put as much dollar-for-dollar value into a car as possible, but that a very definite system of service must accompany our merchandising efforts if we are to build good will along with good cars.

Every dealer must not only keep a complete line of repair parts, but he must also maintain a thoroughly equipped and practical service department. It is the duty of Mr. Evans to check up on this system and his work does not stop with a visit to the dealer. He goes about town interviewing the individual owners to get their reports, for that is the way to get the real evidence—out in the field where the cars are being used in daily service.

ANNUAL BANQUET OF M. & A. MANUFACTURERS.

The annual banquet of the Motor and Accessory Manufacturers will be held on the evening of Jan. 10 at the Waldorf Astoria hotel in New York City during the week of the national automobile show in the Grand Central Palace. The

other members of the show committee are: W. M. Sweet, chairman; C. E. Thompson, the Steel Products Company, Cleveland; C. W. Stiger, president of the Stromberg Motor Devices Company, Chicago; T. J. Wetzel, the Harrison Manufacturing Company, Lockport; James H. Foster, the Hydraulic Pressed Steel Company, Cleveland; Christian Girl, the Perfection Spring Company, Cleveland, and L. M. Bradley, manager of the M. & A. M.

KING ADDS \$50 TO PRICES OF THE EIGHT.

The King Motor Car Company, Detroit, has officially announced an advance of \$50 on the list price of the eight-cylinder King car, to become effective Nov. 15. This brings the price of the seven-passenger touring car and three passenger roadster to \$1400 each, and the sedan to \$1950, all f. o. b. Detroit. President Artemas Ward, Jr., gives no assurance that this will be the final announcement of advance.

LAKES TO GULF HIGHWAY.

Miss Lillian Stuart, a delegate from St. Louis to the American Prison Association, which recently held a convention in Buffalo, N. Y., outlined plans for a highway reaching from the Great Lakes to the Gulf of Mexico to be constructed by convict labor and unemployed men.

The "Arcadian Highway," as Miss Stuart would call the new road, would be 80 rods wide and about 1000 miles long. "It would be a free highway with a centre way for an auto speedway and side roads for local traffic—straight for 100 mile stretches," she said, in laying her plan before the convention.

PIERCE-ARROW COMPANY TO BE REORGANIZED.

In a dispatch from Buffalo, N. Y., it is announced that control of the Pierce-Arrow Motor Car Company of that city would pass before Jan. 1 into the hands of a syndicate of bankers who will form the Pierce-Arrow Motor Car Corporation. Heading the syndicate is J. & W. Seligman & Co., New York City bankers, who are associated in the deal with other banking interests of that metropolis.

It is announced that George K. Birge, now president of the Pierce-Arrow Company, will be succeeded by Col. Charles Clifton, the present treasurer of the company. In other respects the present organization will remain unchanged.

The new Pierce-Arrow Corporation will have 100,000 shares of eight per cent. convertible preferred stock and 250,000 shares of common, no par value. The preferred stock will be redeemable at 125 and will be convertible into common stock on the basis of share for share.

All the stock of the existing company will be acquired and arrangements will be made for the retirement of the present \$1,250,000 six per cent. bonds on Feb. 1, 1917.

Enclosing the Car for Winter Service.

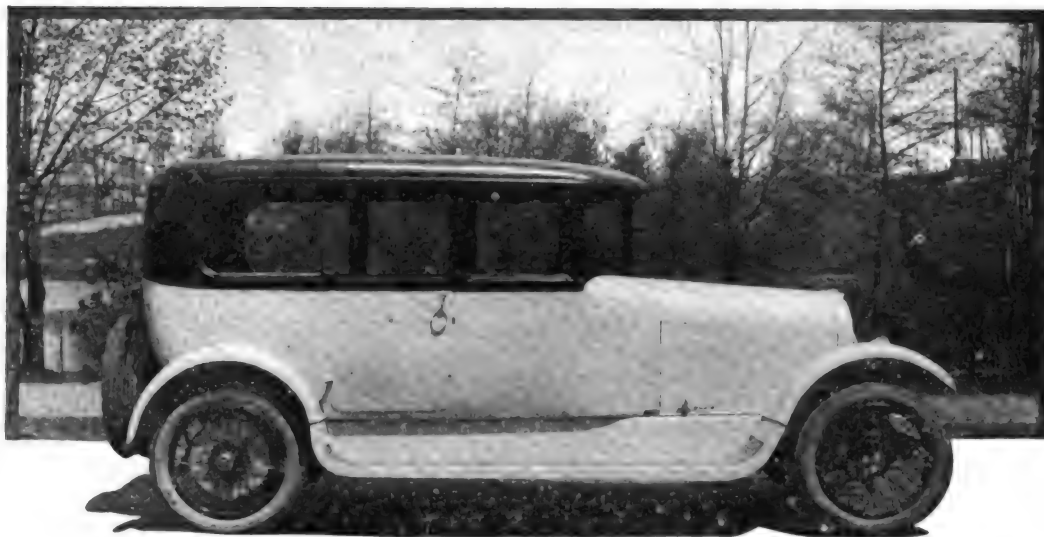
AMONG the more noticeable tendencies in the progress of the motor car industry is the practise of providing cars with tops that will admit of their being used continuously throughout the year. The superstructure of several standard cars for 1917 are so constructed that the interiors can be easily and quickly enclosed for protection against the cold and storms of winter and left open for summer driving.

The owners of cars not so equipped have evinced a desire to obtain the same range of operation, and consequently the makers of special bodies and tops have this year concentrated more than ever on the production of "ready-to-install" tops that can be mounted on almost any standard chassis, and at very reasonable prices.

Value of Changeable Tops.

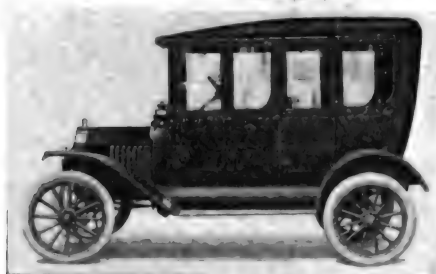
The range of choice in that type of top is extremely wide, and in every case they provide the maximum of comfort and generally add much to the exterior appearance of the car. They compare favorably in appearance with the built-on enclosed bodies and the degree of protection against the elements that makes for luxurious operation in winter time. They provide opportunity for the owner to obtain the greatest possible use of his machine, making it unnecessary to lay up the car for the winter, a factor that is appreciated by every one, whether they use the car for pleasure or business.

Until recent years it was almost universal practise to store the car for the winter, the owner taking to the street



The Brunn Enclosed Body on a Marmon Chassis, Owned by Glenn Curtiss.

Converting the Open Roadster or Touring Car Into a Closed Car for Use while Jack Frost Has the Land in His Grip--Description of Representative "Ready-To-Install" Tops for Standard Chassis.



Wadsworth's "All Season" Limousine Top on a Ford Chassis.

car, railroad train or "shank's mare" when cold weather arrived. He not only thus ties up a considerable amount of money, as represented in the cost of the machine, from which he was obtaining no return, but also was paying out money for transportation by other methods when he had in his motor car one of the best and most flexible means of travel, but was unable to use it. The enclosed winter body and top have changed the complexion of the situation, and manufacturers are reporting this year the greatest demand for bodies for winter use they ever experienced.

All Season Service.

Among the changeable tops now obtainable the majority are superior in appearance and service to the top that comes on some cars as standard equipment. Most of them can be left on the machine throughout the year without detracting from appearances or comfort.

These tops are built for the smaller and cheaper cars, as well as for the very expensive models. On the latter they

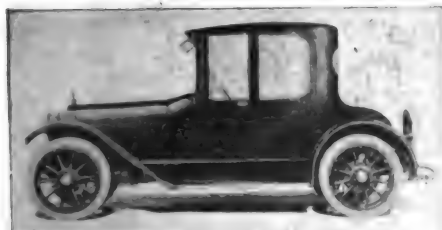
are designed in keeping with the finish of the car and have sliding glass windows, overhead lighting equipment and all the luxurious appointments of a limousine top. They can be taken off or mounted with little loss of time and the minimum of labor and are comparatively low in cost considering the many advantages they afford.

In the following will be found descriptions and illustrations of

several representative tops that are now on the market. It is impracticable to present here the full details of their construction and method of installation; such information is obtainable from the manufacturers, whose names are given with each description.

Tops for Ford Cars.

The TopFord, which is described as "the perfect limousine for Fords," by its manufacturer, the Detachable Limousine Company, Inc., of Hempstead, N. Y., when adjusted to the Ford touring car, becomes a part of the car itself and is snug, tight, weather proof and will not leak or rattle. Metal and wood is used in its construction and there are no canvas or leather curtains. The top includes a polished plate glass windshield and the windows and doors are set with clear crystal glass and in a manner to prevent them from rattling. The frame is of a seasoned wood with heavily nicked trimmings. A light colored lining is used on the interior and slip covers are furnished to match, giving the interior of the car a handsome upholstered appearance. The equipment included with this top for the touring cars includes a dome light, flower vase and silk curtains for



Limousine Top Company's Coupe Top on a Haynes 36-R Chassis.



Detachable Limousine Top Company's Scripps-Booth Top.



White's Limousine Top for Fords (Closed).

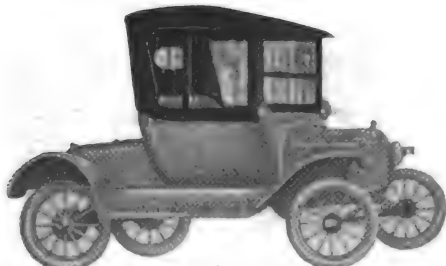
the side and rear windows. The top for Ford touring cars sells for \$135 and for Ford runabouts the price is \$110, both prices being F. O. B. Hempstead.

This concern attracted considerable attention in the top industry through its introduction of the Scripps-Booth top for the eight-cylinder, cloverleaf body on that make of chassis, and also its Buick-Nassau winter top. The Scripps-Booth top has a close resemblance to a custom made job and it is in perfect harmony with the lines of the body. A three-ply mahogany veneer, velvet finish on the rear and middle sections and doors gives it an ultra modern and distinctive appearance. The top sets perfectly flush with the body and is attached in a manner that conceals all the irons. James S. Booth of the Scripps-Booth company, who has distinguished himself as a body designer, co-operated in the design of this body.

A Top Made of Agasote.

The Buick-Nassau top is entirely of agasote and is without a single jointed panel. It is made of one piece, which extends entirely around the body from one side of the windshield to the other. The windshield is made in three pieces of the very latest design and with attachments for controlling the ventilation and setting the sections as desired. The interior finish is in keeping with the high class work throughout and slip covers to match the lining are furnished. Additional equipment includes a vanity case, electric cigar lighter, vase, umbrella stand and electric dome light.

Brunn & Co., Inc., of Buffalo, N. Y., builds for high class cars an exclusive type of enclosed body which has a number of distinctive features. The illustrations at the head of this page shows one of these bodies on a Marmon car, belonging to Glenn H. Curtiss, the famous aviator and aeroplane manufacturer. A feature of these bodies is the pointed front shield, which is made in two sections. When mounted on a Cadillac the lamps and ventilators are in the cowl, while a removable trunk rack is fitted on the

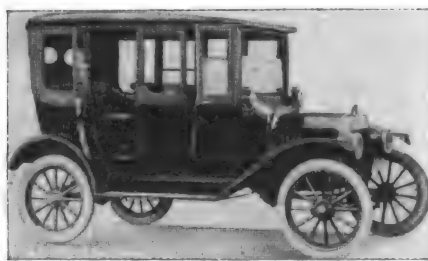


KoupetTop on Ford Roadster, Enclosed.

rear deck. The sidelights and windows can be dropped completely out of sight and the centre pillars are removable, leaving the car open from the front to back for driving on mild days.

Wadsworth "All Season" Tops.

The "All Season" limousine top for Ford cars, manufactured by the Wadsworth Manufacturing Company of Detroit, Mich., can be fitted to the 1915 or 1916 Ford touring car or roadster without any changes whatever to the body or the windshield. They can also be attached to the 1913 or 1914 models by using the De Luxe combined windshield and cowl, for which an additional charge of \$12 is made. Fitting close to the body, with no overhang or unsightly attachments showing, the tops are extremely attractive and greatly improve the appearance of the cars. The materials used in the interior are the same as are used in trimming Ford cars and the top meets the windshield in such a manner that the latter may be opened and closed and yet is rain or dust proof. The tops sell at \$55 each, f. o. b. factory Detroit. The Wadsworth company also makes a line of tops for Studebaker cars, Buicks and other models.



Springfield Top-Notch Top on a Ford.

The Limousine Top Company of Kalamazoo, Mich., manufacturer of demountable limousine and coupe tops, make a specialty of two types, known as the De Luxe models for Chalmers and Haynes cars. The construction throughout is of the very highest quality and in keeping with the high grade specifications followed out by the most expert body builders. The frames are made of hard wood and put together with glue and screws and the rear quarter and deck is of solid construction of best material. First quality hard wood stock is used in the side panels and door frames. Wherever curved or bent glass is necessary to conform to graceful body lines it is used, and the entire design is in keeping with the form of the main bodies on both the touring cars of each make, as well as the roadsters. The beautiful interior finish is greatly enhanced by an electric dome light and silk curtains in the back and side tonneau windows. They are designed to meet the requirements of both summer and winter use, the side panels and doors being detachable. Prices on the various models are as follows: De Luxe sedan top for Haynes touring car models 36-37, \$275; De Luxe coupe top for Haynes roadster model 36, \$275; De Luxe



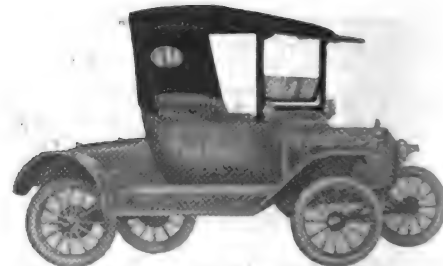
White's Limousine Top for Fords (Open).

closed top for Chalmers Six-30, five-passenger touring car, \$275; De Luxe closed top for Chalmers Six-40, seven-passenger touring car, \$300. All prices f. o. b. Kalamazoo, Mich.

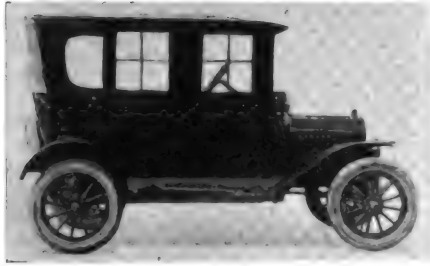
An enclosed limousine top and an enclosed roadster top for Ford cars is manufactured by the Geo. White Buggy Company of Rock Island, Ill. The limousine top for the Ford touring cars, 1915-16 models, which sells for \$65, is designed for permanent use. It meets all the requirements of winter operation, and for summer has many advantages over the standard folding tops. The doors are perfectly hinged and open and shut as a unit with the doors in the body of the car. It is fitted to the irons that come on the Ford bodies and can be attached in a short time. For summer use the panels and doors in the side may be removed, leaving a clear opening from the windshield to the rear curtains. Curtains for summer use instead of the panels may be obtained from the manufacturer at a slight additional cost. The roadster top for the same model Fords sells for \$50.

"KoupetTops" for Fords.

The "KoupetTop" for Ford roadsters, made by the Heinzelman Brothers Carriage Company, Belleville, Ill., is really a De Luxe product of its type for this model of car, having five heavy glass panels and windshield. The panels above the door slide easily on hangers to admit of entrance and the rear panel, which is extra large, swings outwardly and is held in position by self locking hinges. The upper and lower sections of the windshield may be swung either outwardly or inwardly and are held in place by the locking hinges. The roof is dome shaped and is covered with a weather proofed fabric and the interior is lined to match the car. The top, which is fastened onto the body by the top prop irons, can be removed and in one piece by simply loosening the bolts. The "KoupetTop" for the 1915 Ford roadster is \$80 and \$82 for the 1914 model. The



KoupetTop on Ford Roadster, Open.



Fouts & Hunter Cozy Cab.

Heinzelman Brothers Carriage Company also make a Light Model Top for Ford roadsters which sells for \$37.50.

The Fouts & Hunter Carriage Manufacturing Company, Terre Haute, Ind., makes tops known as the Cozy Cab line. The "Limousine" line, including both touring and roadster tops, are sold direct from the factory to Ford owners. The De Luxe line is sold to dealers.

The limousine tops have curtains mounted on special made steel spring rollers, with the front and back edges working in a metal groove $1\frac{1}{2}$ inches deep, which holds them rigid and prevents rattling or displacement. The tops are designed for use in all seasons and can be thrown open instantly by the driver or any occupant without stopping the car. This feature is an excellent one and is appreciated when a shower comes up suddenly. The driver may enclose his car without getting out in the rain and when it is over he can throw the sides open again with four motions of the hand.

The Cozy Cab limousine top sells for \$48.50 and the Cozy Cab roadster top at \$32.50, both prices f. o. b. Terre Haute, Ind.

Complete Line of A-W Tops.

A distinctive line of tops of the all-weather convertible type, with glass doors and panels, which not only meets all the requirements of the all-weather car, but greatly adds to its appearance, is manufactured by the Adams-Williams Manufacturing Company, 1790 Broadway, New York City. This concern makes these tops for Fords, Dodge cars, Cadillacs and other makes. In applying these tops no alterations or changes are necessary in the body of the car and when removed the body is left as clean and in as good condition as it was originally.

There are several important and new features incorporated in the construction, which with the exception of the rear bow, is all metal and steel. The glass windows and panels are set in steel frames which are proof against shocks or severe usage. A patented construction of the top prevents weaving of the frame or the communication of any body movement to the glass. The occupants can use one or more panels as desired. They are retained by a concealed spring that is operated by the fingers, and when all the panels are removed and the top is up the car cannot be distinguished from a touring car. When the body is all enclosed for stormy weather good ventilation is afforded, although dust, snow, rain or wind cannot enter.

Distinct tops are built for each model of car. The Ford can be fitted out in two hours, either the 1915, 1916 or 1917 models, either touring or runabout bodies. For Pierce-Arrows, Locomobiles and other cars with varying body lines it takes longer to equip them with "A-W" tops, as the lines of the tops are made to harmonize with the lines of the car bodies. The Ford tops attached to touring cars are priced at \$85, and the runabouts, attached, \$60. These tops can be converted either for open touring with the hood folded back or completely enclosed within three minutes.

The Anchor Buggy Company, Cincinnati, O., makes the Anchor sedan glass enclosed top for Ford touring cars and the Anchor coupe glass enclosed top for



Adams-Williams Top on Cadillac Eight.

the Ford runabout, and also enclosed tops for both the touring and roadster models of the Oakland car. The Anchor sedan, which converts the Ford touring car into a comfortable limousine, sells for \$77.50. Drop ventilating windows in



Adams-Williams Top on Dodge Bros. Car.

the two rear doors, equipped with improved anti-rattling attachments, are furnished for \$5 extra. For similar equipment in both front and rear doors, which is called the Anchor sedan (style C), the price is \$87. The price of the Anchor coupe for Ford roadsters is \$62.50 without ventilating windows and \$67.50 with. Additional equipment may be had for both types, including a frosted dome electric light wired complete to attach to batteries for \$5; storm curtains made of water proofed rubber, with mica lights, to be used when side windows and doors are taken out, \$10; storm curtains for runabout top, \$7.50.

Top for Oakland 32.

The Anchor glass enclosed top for a regular Oakland 32 body is a regular coach construction of pressed steel and wood, with solid deck roof, covered with water proof upholstery material. The doors and top of car open together and

the hardware throughout is of neat design. Whipcord lining is used on the interior of the top, which is also equipped with electric dome light. The price of this type is \$125. For the same model Oakland roadster Anchor tops are made of similar design and material at a price of \$100. All prices are f. o. b. Cincinnati.

Springfield Top Notch Tops.

The Springfield Commercial Body Company, Springfield, Mass., manufactures a line of tops for Ford and Maxwell cars which are known in the trade as "Springfield Top-Notch Tops." These are built to fit so closely that they are absolutely noiseless and rattle proof and the windshield when closed fits flush with the roof of the top, making it impossible for rain, dust or wind to penetrate the interior. The same materials used in finishing the car are used as trimmings in finishing up these tops, giving the "job" a tailored appearance. Heavy glass is used throughout in the panels in place of celluloid or other glass substitutes. The back is of solid metal on the Maxwell tops and the frame and workmanship throughout show substantial construction and beautiful design. The Maxwell tops sell at \$150 each f. o. b. factory, Springfield, Mass., and the Ford at \$57.50.

Types of Detroit Tops.

The Detroit Weatherproof Body Company of Detroit, Mich., makes a large variety of detachable limousine tops that can be fitted to 10 different car models.

These tops are attached to the regular body irons and do not leave any scratches or defacing marks upon the car when detached. They come completely equipped with lighting equipment and exceptionally fine interior finishes.

The prices on the tops for the different models are as follows: For Hudson Super-Six phaeton (including three-piece built in windshield), \$160; Chandler 1916-17 seven-passenger touring (including three-piece built in windshield), \$160; Cadillac 1916 touring (including rain vision visor to be fitted to standard windshield), \$160; Chalmers Six-30 five-passenger (including rain visor to be fitted to standard windshield), \$140; Buick D-45 Light Six, \$125; Overland model 83, \$115; Maxwell standard touring car, \$100; Chevrolet Four-Ninety, \$90; Ford standard touring (including rain vision ventilating shield), \$77; Ford roadster (including rain vision ventilating windshield), \$70.



Anchor Glass-Enclosed Sedan Top.

Providence Opens Biggest Show.

Spaces Allotted for 250 Vehicles in the State Armory Which Has Been Beautifully Decorated.

THE eighth annual automobile show held in the State Armory at Providence, R. I., under the auspices of the Rhode Island Automobile Dealers' Association, organized and directed by Percival S. Clark, is the largest exhibition of its kind ever held in New England outside of Boston. In number of cars and variety of models the show is one of the biggest staged so far this year, but the principal feature is the fact that there are on exhibition many of the very latest models that have not been shown in the East before, having been recently received from the Pacific coast, where they were on display. Space was allotted for 250 vehicles, while last year there was only 176.

Within a 50-mile radius of Providence there are over 1,000,000 people and within a 100-mile radius there are over 2,000,000, a fact which has made the Providence show a Southern New England institution. Manager Clark has kept the scope of the show in mind this year as he did last and the decorations are on a scale and of a character in keeping with its patronage.

The decorative scheme this year is one of the most beautiful ever employed in a large auditorium. The idea of Venetian garden is carried out on a grand scale, with exquisite detail and wonderful color effects. Statuary, entwined with garlands of foliage, mark off the aisles in imitation of canals. The general effect is enhanced by hanging baskets of flowers and trailing vines, while the whole is transformed into the effect of an Italian sunset by the light from thousands of tungsten lamps, which throw out illumination in golden rays. A panorama of Venetian scenes encircles the walls on a huge canvas and at the end of the hall there is a large canal scene, showing gondolas, bridges and plazas. A band stand, gorgeously draped, occupies the centre of the hall and in addition there is another stand in the basement, where the commercial cars are on exhibition.

Practically every type of car manufactured in America is on display at the show, including touring cars of every description, roadsters, runabouts, limousines, landaulets, coupes and many of the convertible types that have become popular in the last year. The commercial car exhibit is also representative of the industry, including types from the light delivery cars to the heavy haulage tractors. This department of the show has 20 more makes of trucks than were shown last year in the Armory. There is also an exhibition of motorcycles and a big line of accessories and miscellaneous appurtenances of the automobile.

One of the special feature exhibits is the Sturtevant hydro-aeroplane of the Aeronautic Division of the Rhode Island Militia. To display it advantageously

and give the patrons of the show a better idea of how it looks in action, it has been suspended overhead from the steel trusses which arch the big hall.

The show opened Nov. 10, continuing to the evening of Nov. 18. Wednesday of show week will be both society night and city government night.

The officers of the Rhode Island Automobile Dealers' Association, which is conducting the show, are: Charles F.



Percival S. Clark, Organizer and Director of Providence Show.

LIST OF EXHIBITORS.

Pleasure Cars.

Aetna Bottle and Stopper Company, Buick and Marmon.
Broadway Sales Company, Dodge.
Becker-Stutz Auto Company, Stutz.
Barre, Charles, Auburn and Allen.
Cadillac Auto Company, Cadillac.
Cutler-Morse & Co., Alfred, Roamer.
Chevrolet Motor Company, Chevrolet.
Chase, E. B., Velle.
Davis, Nelson S., Locomobile.
Davis, Richard G., Haynes.
Foster-Smith Company, Winton, Woods
Dual Power and Chalmers.
Foss-Hughes Company, Pierce-Arrow.
Fuller, William H., Cole and Grant.
Howard, Albert J., Scripps-Booth.
Hughes, Wm., Company, Reo.
Kenworthy-Clark Company, Studebaker
and Owen Magnetic.
Knight Auto Company, National and White.
Longley Motor Sales Company, King.
Union Motor Car Company, Mercer, Stearns, Knight.
Lord & Knott, Jordan.
Lorimer, L. B., Company, Hupmobile.
Mevis Motors Company, Chandler.
McCormick, Joseph, Peerless.
Narragansett Electric Lighting Company, Detroit Electric.
Nock, Edgar L., Moon Sixes and Dixie Flyer.
O'Donnell, John, Jeffery.
Powers, Robert W., Hudson.
Paige Motor Car Company, Paige.
Packard Motor Car Company, Packard.
Pugh Brothers Company, Oakland, Overland and National.
Richards, Walter R., Mitchell.
Stone, Chauncey M., Dais.
Wilcox, Wallace L., Franklin.

Commercial Cars.

Arter, Roland E., Federal.
Crane, Harold C., Chase.
Foss-Hughes Company, Pierce-Arrow.
Hopkins, B. F. and A. W., Reo and International.
Kenworthy-Clark Company, Studebaker.
Knight Auto Company, White.
McCormick, Joseph, Peerless.
O'Donnell, John, Republic.
Packard Motor Car Company, Packard.
Pugh Brothers Company, Willys Overland, Bessemer and Acme.
Vim Truck Sales Company, Vim.

Accessory Exhibits.

Auto Metal Works, Fracto headlight.
Providence Auto Equipment, headquarters.
Presto Cloth Company, Presto-Cloth.
Swan & Finch Company, oils and greases.
Shaw Propeller Company, carbonoid and Shaw wrenches.
Parker-Risher Sales Company, Parker cleaner.
Lewis-Shepard Company, gill-ring.
Iyer-Johnson Sporting Goods Company.
Quick-Rub Chemical Company, quick-rub cleaner.

Thatcher, president; John O'Donnell, vice president, and Percival S. Clark, secretary and treasurer. The directors are: Charles F. Thatcher, John O'Donnell, Percival S. Clark, William Hughes, Alva H. Hitchcock, John E. Pugh, Harold C. Crane, Walter P. Pierce and Herbert E. Bradford.

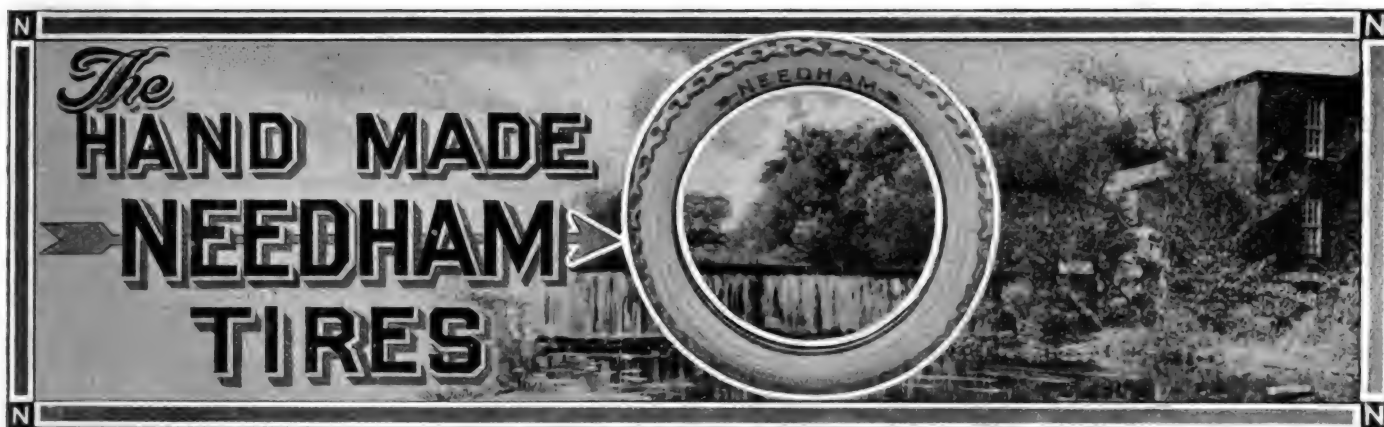
PAIGE TO BE USED IN "KNOW AMERICA" FILMS.

A. L. Westgard, a pioneer road finder, who has been identified with the laying out of the Lincoln Highway and the Jefferson National Highway, has been engaged by the Pathe Exchange, Inc., to make a series of moving picture films to be known as the "Know America, the Land We Love" series. It will be made up of views from all over the country, including scenic and historic places. Mr. Westgard will travel by automobile on his country wide pilgrimage and has selected a Paige Fairfield "Six-46" for the work. He will be accompanied on the journey by his wife and son and two photographers.

NEW SCHEME TO CHECK AUTOMOBILE THEFTS.

The latest scheme to discourage thefts of automobiles originated with a man in Minnesota, who would require that everyone buying a new automobile be given a bill of sale from the maker and attested by the agent, and that when he sold the car, he also would give the purchaser a bill of sale which would enable the authorities to trace the ownership of any machine directly back to the maker. By making it a criminal offense for anyone to buy a car without obtaining a bill of sale, this system is expected to greatly discourage the thefts of machines.

The Illinois State Legislature at its next session will be asked to grant a special election to enable the voters to authorize a \$10,000,000 bonds issue for the purpose of building a modern road from Chicago to Cairo, Ill. The work of petitioning the Legislature has already been taken up by the Egyptian Trail Association, the National Old Trails Association and the Lincoln Highway in that state.



OPERATING with power taken from the historic Charles river, which, though one of the shortest, is one of the best known of all American streams, the plant of the Needham Tire Company, at Charles River, Mass., is distinct from all other factories that are producing automobile shoes. This is also a large factor for economy, for the price of coal is constantly increasing, and not only does the river furnish all the power for driving the machinery, but it generates electric energy that is used for lighting and for the motors that are installed about the plant. The river is dammed and only a part of the available water power is utilized, so that a very material expansion may be made before steam will be necessary. The only need for steam is for heating the factory and for curing the tires.

The plant of the company is a spacious structure of brick, stone and steel, located on the east bank of the river beside a dam that was constructed to develop practically all of the flowage at that point, and the property consists of 17 acres of land, which may be utilized for building as the needs are manifested. The locality is picturesque and attractive and there are no evidences aside from the dam that here has been founded a thriving industry that is growing with extreme rapidity and has almost unlimited possibilities.

Company Founded in October, 1914.

The Needham Tire Company is young in the fact that it was founded two years ago—in October, 1914, to be exact—but it is old in the sense that its officers and executives have been identified with tire manufacturing for long periods, and have experience both in production and distributing. Besides this, they know the requirements of the motorists of America, and the company was organized with the knowledge that there was a demand for an exceptionally high grade tire that could be sold at a reasonable price for the particular size, or rather any specific size.

Generally speaking, quantity production means manufacturing economy, but when a very high quality is desired this can only be obtained by methods that limit volume, for extreme care is essential to every detail. There was realization by the officers of the company that success could be attained by producing a cheap tire in large quantities or making a tire that would give better results and be demanded as soon as its qualities were known, and they chose to produce what they claim to be the best automobile shoes made in America.

For this reason they established a comparatively small plant, which is equipped with the finest machinery obtainable, and organized a production department that is in charge of a man of extremely wide experience. The

Needham tires are all hand made and they are all produced by the two-cure wrapped method, which is maintained to be superior from every point of view to the molded product, because of the manner of curing, and the results that are obtained from it.

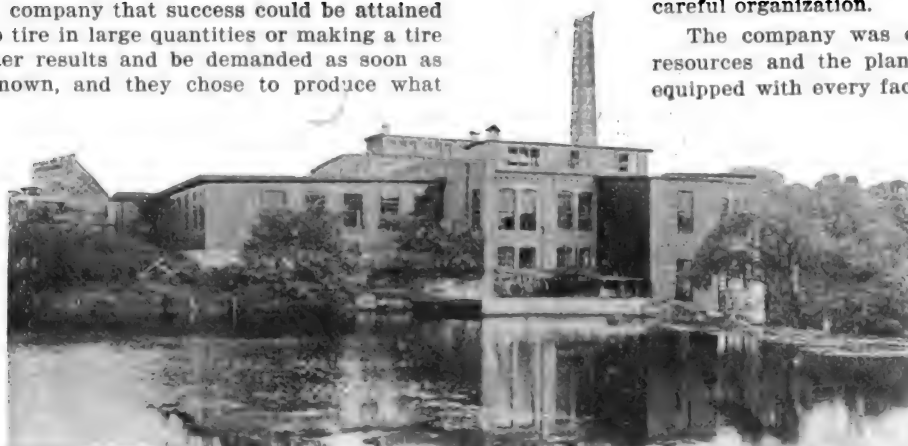
The Personnel of the Company.

The personnel of the company's officers is interesting to the buyers of Needham tires because its affairs are directed by men who have knowledge and experience and understand not only what is demanded in an automobile tire, but what methods will insure the quality that is necessary to insure service. John S. Patterson is president of the organization, Chase Langmaid is acting president and sales manager, James M. Patterson is vice president and factory manager, and W. Louis Williams is treasurer. Mr. Langmaid is one of the best known men in the vehicle tire industry, being for 12 years connected with the Hartford Rubber Works Company, Hartford, Conn., and later he was manager of the New England branch of the Federal Rubber Company. He has always engaged in distributing tires and has not only an intimate knowledge of the trade throughout the country, but has experience in meeting the requirements of every class of motorists.

James M. Patterson has been engaged in tire manufacturing for 17 years, in fact, since the industry was established, and he has been associated with some of the largest concerns, being responsible for production of all types of tires. With keen realization of the necessity of learning all that he could of methods of manufacturing, he sought employment with the Continental Caoutchouc Company, Hanover, Germany, which is one of the largest tire manufacturers of Europe, and devoted more than a year to work in different departments of its factories that he might perfect his knowledge of production. This experience was extremely valuable to him, as it fitted him to utilize what is best of both American and European processes, and to produce tires that have all desirable qualities in largest measure and without defects that can be obviated by use of material, workmanship, inspection and careful organization.

The company was organized with ample resources and the plant was purchased and equipped with every facility required for producing a series of

tires of exceptional quality. The machinery and tools installed were limited, for a market must be developed, and the plant was departmentized with a view to increasing production as the sale of tires demanded. Shortly after the company was incorporated the operation of



The Plant of the Needham Tire Company, Charles River, Mass., Operated Exclusively by Water Power.



The Fabric Room, Where the Cloth, Untreated and "Frictioned," is Stocked and Cut to Widths for Tire Making.

the plant was begun, and Acting President Langmaid found his first market in Boston. The policy of the company was to market through distributors only and not to establish branches and service stations, and as rapidly as possible the number of agencies was increased. During 1915 the activities of the company were extended to all commercial centres of New England, but during the present year these have been extended into a number of eastern states, and plans have been perfected so that Needham tires will be sold throughout the country.

The company has been careful and conservative in its expansion. The endeavor has been to demonstrate the quality of the tires and to produce what will meet the demands with a sufficient reserve of all sizes to supply all orders, the output being increased from time to time until now, although the high mark of the selling season has been passed, about 100 tires and 200 tubes are made daily. Plans have been approved and contract made for two new buildings which will be erected before the first of the year, one of which will be a storehouse and the other an office. When these are completed and occupied space will be released that will be available for manufacturing, and the officials now plan that they will have a daily production of 400 tires and about 800 tire tubes. The company has also made plans for the manufacture of a wide range of rubber tire accessories, such as patches, sleeves, boots and stock, such as is needed by the owner who does his own tire repairing so far as is possible, and will specialize these.

The intention is to increase the plant and its production department as the needs are demonstrated by the market, and this can be done quickly should the distributors meet with anything like the success that has been met with in the New England and eastern states. As has been stated, the factory can be very greatly enlarged before the maximum of the horsepower that is available from the river flow has been reached, though, of course, steam for heating and curing the tires will entail some additions to the boiler equipment of the plant. There will be, of course, the relative saving with the increased utilization of water, this value being the market price of fuel delivered. As there is every reason to believe that the cost of coal will be more

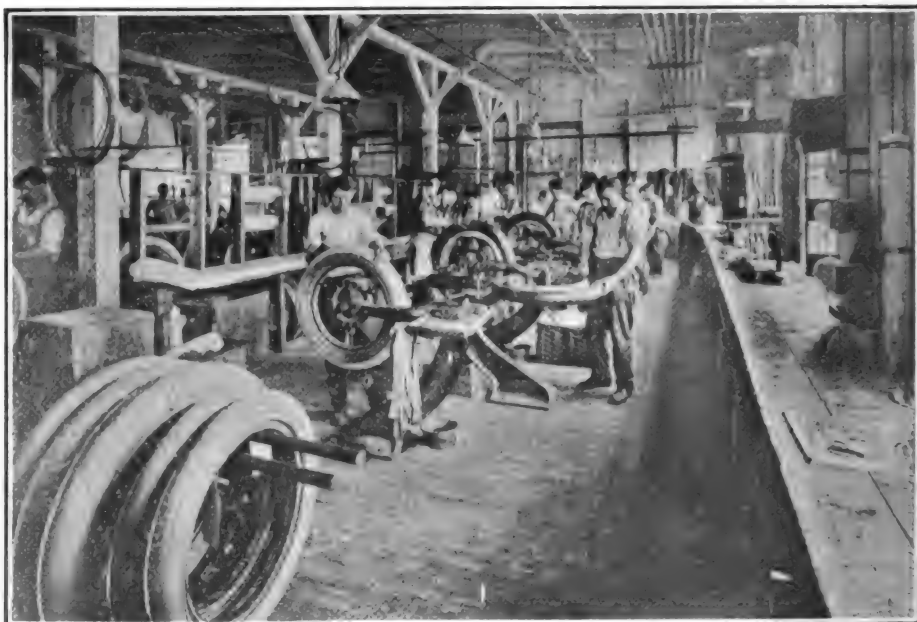
than ever before, the good judgment of locating where water power is obtainable is apparent.

The manufacture of Needham tires is by hand from the fact that as the workers can examine all material that is used there is certain knowledge that it is up to the standard. By hand work is meant that the building of the carcass or shoe from the base is not done with machines. There are, of course, some processes that are much the same in the making of all tires, but machines are not used for producing what is really the foundation of the shoes.

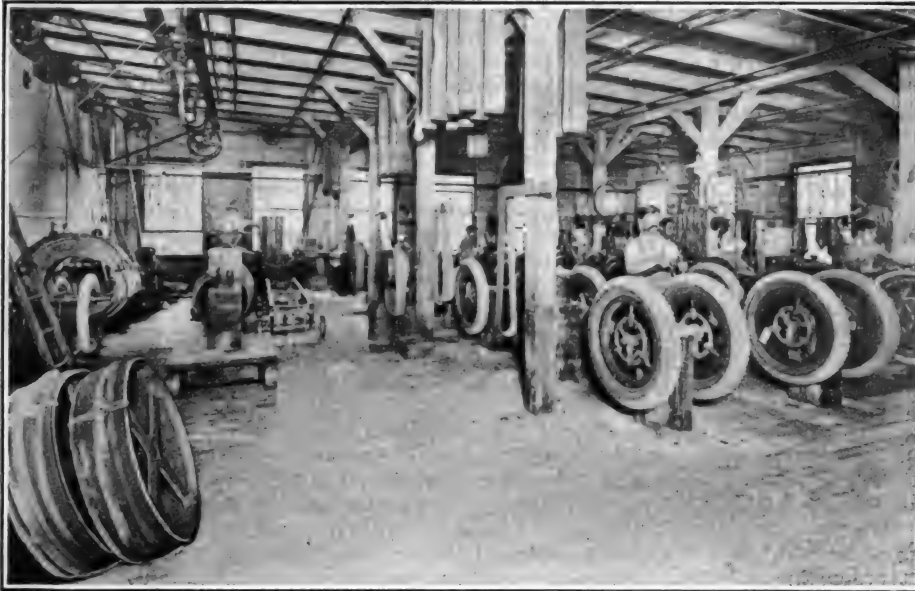
The crude or raw rubber is received at the works in the form of biscuits, these being the accumulation of the fresh gum of the caoutchouc or rubber tree as dried over fires by the Brazilian natives. The biscuits are formed by dipping paddles into the latex or liquid sap of the trees that is accumulated in differing type vessels and holding the paddles over the fires, the smoke coloring the gum as

it dries. In the biscuits there are varying particles of foreign matter that must be removed, which is done by grinding or reducing the biscuits to what may be regarded as granulations and by washing. This work necessitates cutting the biscuits and passing the rubber through machines and through water, so that stones, dirt, pieces of wood, grass and the like are either precipitated or carried off.

The granulated rubber after drying is then ready for the different uses made of it. It may be dissolved by a solvent so that it is in different degrees of fluidity and may be used as cement or is semi-plastic, or it may be made into sheets of varying thickness of practically pure gum, or it may be in a granulated state so that it may be mixed with other rubber, less pure, and with the material that when combined is known as "compound." The compounds differ with reference to proportions according to the uses to be made of them. Obviously, pure rubber would not have strength and its extreme elasticity would not afford the permanent form that a tire must have, and so a tire compound must have an exact result when it is "cured" or treated. These compounds are made to formula, the different elements being proportioned by weight or volume, and the compounding is usually carefully guarded,



A Section of the Tire Building Department, Where the Casings Are Constructed by Hand Prior to Semi-Curing.



In the Treading Department, Where the Treads Are Applied to the Semi-Cured Shoes Before the Final Curing.

for the formulae are only developed by careful service experiment and observation and compounds made by them must be given such treatment as will afford the maximum endurance.

Different Grades of Rubber Used.

To illustrate, several different grades of rubber, so-called, is used in the construction of a tire. One grade is used in "frictioning" the fabric, another for the beads, a third forms the cushion, and the fourth the tread. These differ in what may be described as body, which probably expresses the quality quite as well as any other term that might be used. Rubber cannot be compressed, but it can be deformed or made to displace a varying area within the limits of its elasticity. By this is meant that a cube of gum rubber may be flattened or rounded or given varying shapes by pressure, but its area will not be reduced and it will, when released, assume its original form.

In the manufacture of tires the principal strength is obtained by the use of cotton fabric, which is incorporated into the shoe or casing and which is firmly united with the material or compounds. The shoe must be strong enough to resist a considerable pressure. The tire may be inflated to any specific degree and when on a wheel and subjected to a very heavy shock the body of the tire is displaced, and even if there should be a very great displacement the internal pressure upon the tire is not greatly increased. The particular part of the tire where the shock is sustained may, however, need to resist a much greater stress than any other part, but this is in part minimized by the yielding of the tire and the absorption of the blow upon the cushion of air that is contained within the tube that the shoe encloses.

The general construction of the tire is with a view of absorbing the stresses, or generally distributing them, which is the explanation why an automobile shoe will endure strains that are seemingly far in excess of what such structure will withstand without deterioration. The tire tubes are designed to retain the air compressed from 50 to 100 pounds and are expected to yield and conform to all changes of shape of the shoes, and they will not leak if rightly constructed so long as the casing remains intact.

But the shoe itself is made with a comparatively heavy tread and thin

side walls so that the greatest distortion from load is transversely. This causes what is known as "flattening," so that a larger area of the casing contacts with the surface, the section of the tire being changed longitudinally as well as across, and at the part of the tire that is flattened the rubber is displaced. This displacement is usually greatest in the centre of the flat area and decreases from this centre to the extremities where the pressure ceases. When the tire is driven on a vehicle the flat area of the surface contacting with the road varies with the load, and as the wheel revolves a wave or "ridge" is created in the rubber at the point where the periphery of the tire contacts, that exists so long as the wheel is in motion. This wave-like motion of the rubber may be very rapid, and if continued, as when a machine is driven very fast and for a considerable time, the rubber will become heated from its own movement, or friction, as most motorists understand this action.

Unless the compound is very carefully prepared and treated to have the precise degree of body or hardness, and yet a sufficient quality of absorption of shock, and resiliency to conform instantly from deformation, it will not endure, and with these extreme requirements known one may realize what compounding formulae mean to the tire manufacturer. But while the materials and proportions must be exact, the "curing" or heat treating of the casing is equally important. "Curing" in one sense means the heating of the compounds to the points where they can be built into tire, and later on, after the tire has been built, heating it so that the different rubbers will become plastic or have such fluidity that they will unite or amalgamate into one piece.

Tires that are made for the general market today are to what are known as the S. A. E. standard dimensions, so that they may be interchangeable with wheels of a given size, and they are in several types, usually clincher, straight wall and quick detachable. The clincher type is formed with a bead or head on the edges that engages with the lipped flange of the wheel rim; the straight wall type has a much smaller bead that is strengthened by wire or wires, and the quick detachable has a bead that engages with a lipped flange at one side of the rim and with a locked ring at the other side. The demountable tire is usually a clincher type, carried on a rim that is mounted on the wheel rim and retained by clamps or other devices.



Part of the Press Room, Where the Tires Are Placed in Presses and Given the Final Treatment in Curing Them.

Quality of Needham Tire Materials.

The foundation of all Needham tires is the fabric, which is the best material obtainable and is made of an extremely high quality of cotton, specially woven for tire construction, that weighs 17½ ounces to the yard. This fabric is woven with much care and carefully inspected so that it is known to have no defects. This is received from the mill in rolls or cuts and after examination it is prepared by frictioning, this being a process where the cloth and rubber sheets are passed through heated rollers that reduce the thin sheets of rubber to semi-fluidity. When the frictioning is completed one side of the fabric is coated with very thin rubber that has been forced into and fills all the voids, adhering to the threads. While comparatively little weight has been added the fabric is materially strengthened.

Tires are built regularly in sizes that are standard, the smallest being 28 inches diameter and three inches cross section, and the largest 38 inches diameter and 5½ inches cross section. The fabric is cut in widths for the sizes and in the Needham plant these tires are built on sectional metal cores that are mounted so they can be placed in any position to best convenience the worker. The base of the tire is formed of from four to nine plies of fabric, these being laid with the frictioned or rubberized surface uppermost or outside, with

single ply of frictioned fabric that varies in width from 1¼ to four inches, according to the size of the shoe. Then the tread, which is a section of semi-cured rubber compound, is put on, this being cemented carefully. Next the tire and core is wrapped, strong cotton fabric being wound around the shoe and the core, exact tension being obtained by machines that can be adjusted to any desired degree of pressure. With this wrapping the shoe is cured and after being treated for a definite period it is removed and the wrapping is removed and the sectional core taken out. The tread, which had been partly cured, and the breaker strip, are then consolidated into one solid structure.

The Non-Skid Treads.

The treads for the round or smooth tires are formed on drums that much resemble pulleys or wide rimmed wheels. The treads for the non-skid tires are molded in much the same way, but the surfaces of the drums are stamped with the pattern of the Needham tire, a six-pointed star with an open centre, with two of the points connecting the series around the circumference. The non-skid treads are semi-cured on the drums and these, with the breaker strips, are cemented on and the tires are wrapped and cured.

Much care is taken in inspecting the work and to have the processes uniform throughout, so that a superior tire is produced. Quantity production is not sought, but high quality is absolutely necessary. These tires are guaranteed for a mileage of 3500, but the records thus far show that an average of more than 6000 miles has been obtained, and in many instances much more than the average.

The manufacture of tubes is with equal care to obtain quality, the tubes being heavy and thick and exceedingly durable. The unusual endurance of these tubes is due in large part to the grade of rubber used, which is claimed to be selected with extreme care.

The company has developed its sales department with especial reference to affording quick delivery of orders, and all shipments are sent from the factory by trucks to the railroad and steamship terminals at Boston, where they are handled with the least possible delay, and all express shipments are delivered direct to the stations of the forwarding companies. This careful attention means that the distributors can rely upon orders being filled and dispatched practically upon receipt, and there is no possibility of delay, such as might be possible were the shipping done from the railroad station near the factory or by intermediary companies.

NEW YEAR'S CONCERT.

A New Year's Eve subscription concert and dance will be held under the joint auspices of the Automobile Club of America, the Motor Boat Club of America and the Aero Club of America.

The entertainment committee is composed of the following: James A. Blair, Jr., Richard Howland Hunt, Stephen Peabody, R. C. Rathbone, 2nd., Malcolm D. Sloane, Frederick D. Underwood, Alan R. Hawley, Wm. Pierson Hamilton, Oliver G. Jennings, Herbert S. Carpenter, Henry R. Taylor, chairman.

MAINE REGISTRATIONS.

The total receipts of the Maine automobile registration bureau up to Oct. 16 this year were \$362,354.65. The total registrations for this year to date were 28,332, as compared with 21,374, in 1915.



In a Corner of the Stock Room, Where the Finished Tires Are Made Ready for Storage or Packed for Distribution.

a thin sheet of rubber between each ply. The fabric and rubber sheets are laid on by hand and carefully stretched, the plies being carried at either side and the beads being formed. In the clincher type the beads are made of a material that vulcanizes hard, but yet is so flexible that it will not break under the stresses of installing or removing from the rim. In the quick detachable type the bead material is somewhat harder, so that it will not yield no matter what the strain, and the straight wall types have in the edges from four to nine endless wires, the ends being brazed.

After the Base Has Been Built.

The edges of the fabric enclose or surround the wires or the bead material and the beads are widened to afford substantial bases for the shoes. When the fabric base is built on this is placed the heavy cushion that extends from bead to bead the full width of the case. This is a special compound of rubber that varies in thickness, being thickest in the centre or tread. In this form the case is then semi-cured, so that the plies of fabric, the sheets of rubber and the cushion are practically consolidated. The curing is done by subjecting the shoes to a given temperature of heat for a period determined by experience to afford the best results.

The case is then placed on a stand and the tread is roughened and cemented and the breaker strip is put on. This is a

Fall and Winter Coats.

For deep-winter driving nothing is more comfortable than a heavy fur coat, with huge collar, into which to snuggle. At the left is shown an automobile coat of raccoon that should answer all requirements. The hat is of black satin with white satin facing.

From C. C. Shayne & Co., N. Y.

At the right is seen a very smart motor coat made of "Limosette" and cut along original and fashionable lines that makes this a striking garment for all purposes. The hat is a C. M. Phipps' model and is just suited to this coat.

From Bergdorf-Goodman, N. Y.



Another deep-winter coat is shown in the centre illustration, it being of tiger fur, with hat to match, a very striking outfit for the lady who rides or walks.

From Lamson & Hubbard, Boston.

The white checked black broadcloth coat at the left (bottom row) is one of the season's latest models. Note the cape collar and the deep pockets and belt.

From Oppenheimer & Trebitsch, N. Y.

At the left is another broadcloth coat, with beaver trimmings. The huge beaver collar promises warmth on cold winter days and when the snow is flying.

From J. M. Gidding & Co., N. Y.



Photographs by Joel Feder, New York-



The Five-Passenger Sun Light Six Touring Car.

The Sun Light Six Model.

A Thoroughly Refined and Efficient Chassis
on which Four Types of Bodies are Mounted.

ALTHOUGH the Sun Light Six is an assembled car, the designers have succeeded in adding those touches of refinement and body detail that make it stand out from the other makes in its class. It is built by the Sun Motor Car Company, Elkhart, Ind., and is a light weight, high powered, six-cylinder "job," the touring car selling at \$1095.

Only one size and type of chassis is made, but on it is mounted four bodies: A five-passenger touring, a five-passenger sedan, a four-passenger roadster and a seven-passenger touring body. By concentrating on one chassis the maker is able to simplify manufacturing operations and economize in the cost of production.

The model is an exclusive Sun design in which much attention has been given to mechanical refinement. Its wheelbase is 116 inches, long enough to provide riding comfort and ample room for occupants in the body, and yet short enough to be handled easily on city thoroughfares and congested traffic.

Engine Develops 50 H. P.

The Sun designed engine is of the high speed, high efficiency type, and is guaranteed to develop 50 horsepower on block test. It is a six-cylinder, L head, three by five inch, block casting, the S. A. E. rating for which is 21.6 horsepower. The cylinder head is removable and the valves are located on the right hand side. The crank case is cast integral with the cylinder casting, and throughout the engine is exceedingly simple and compact. Accessibility to working parts is an outstanding feature also.

The manufacturer states that it has been the aim of the designers to produce a car that would operate economically even when the lowest grade of gasoline

is used. Both the intake manifold and the hot air connection are cast integral with the cylinder casting in order that full benefit may be obtained from the heat of the engine.

The valves are large in diameter, the pistons are very light and the three-bearing crankshaft is balanced by curving the webs in such a manner as to scientifically distribute the weight and to allow the engine to operate at very high speeds without vibration.

A feature of the Sun power plant is what is termed as the exclusive Sun dual ejector exhaust manifold. This is divided into two sections which although connected give the effect of two independent manifolds, as the exhaust gases from the three front cylinders are handled independently of the three rear cylinders. These gases are separated by a web cast within the manifold outlet, which guides the gas in the right direction, thereby preventing it from causing back pressure on the other cylinders. Furthermore, the gas rushing by the openings at high speed in the direction of the outlet

causes a slight vacuum or suction. This design is intended not only to overcome back pressure, but to aid in perfectly scavenging the cylinders.

The mechanism by which the valves are actuated is located within the crank case, where it is subjected to a spray of oil, preventing wear and quieting operation. The oil in the lubrication system is circulated by a pump of the plunger type operated from the camshaft and is kept at a constant level in the splash troughs. Cooling is by the thermo-siphon system, the water circulating entirely around the cylinder wall and the valve seats. The inlet and outlet water pipes are amply large, $2\frac{3}{4}$ inches in diameter. The radiator is of the honey-comb type, with capacity of $2\frac{1}{2}$ gallons.

The carburetor is a Rayfield, it being supplied by vacuum system from a 20-gallon tank at the rear of the chassis. Ignition is by Remy system, which is also the name of the make of the starting and lighting system, in which the generator and motor are in separate units.

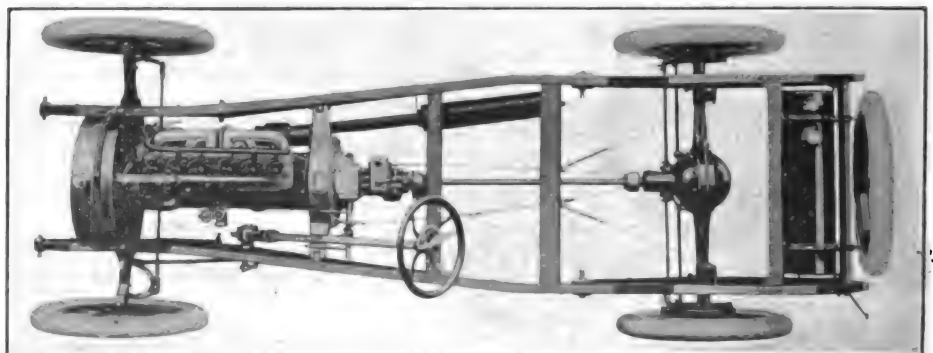
Three-Point Suspension Used.

The unit power plant includes the engine, a Borg and Beck single-plate dry disc and a three-speed selective gearset. The plant is three-point suspended to safeguard the engine against distortion. The rear axle is the full floating type, with ball and roller bearings. The front axle is drop forged with Elliot steering knuckle, cup and cone type ball bearings. Both sets of brakes are of the conventional internal expanding and external contracting types, operating on liberal size brake drums on the rear wheels.

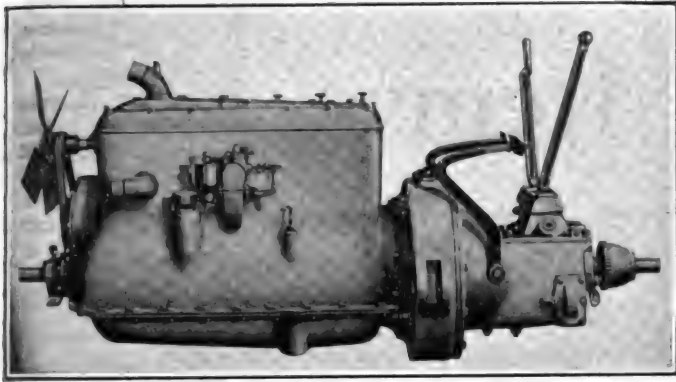
Semi-elliptic springs are used throughout, the rear set being 53 inches long by $2\frac{1}{4}$ inches wide. The rear springs swing directly underneath the frame channels that are arched over the axles at the rear.

The frame is made very rigid, of $5\frac{3}{32}$ inch steel and is reinforced by six cross members. The width of the frame at the front is 28 inches, which provides small turning radius.

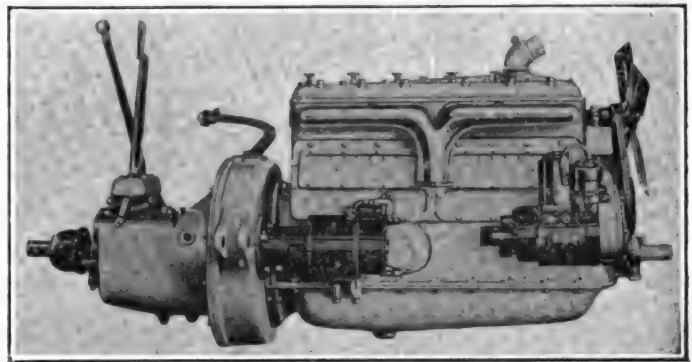
The wheels are 12-spoke artillery type, carrying Firestone demountable rims and 34 by four-inch standard tires, non-skid in the rear. The steering gear is the Jacox irreversible equipment, while among the other outstanding features can be mentioned the one-man top, Jiffy curtains, Burd high compression piston rings, double ventilating rain vision windshield,



The Frame is 28 Inches Wide at the Front.



Left Side of the Unit Power Plant.



Compactness is a Feature of the Engine.

motor driven electric horn, tire carrier at the rear of the chassis and nickel plated robe and foot rails.

The standard color is Brewster green with hood, fenders and running gear in black enamel. The weight of the touring car ready for shipment is 2575 pounds.

RICKENBACHER RACES ON GOODYEAR TIRES.

The article in the October 10 issue of The Automobile Journal about the Astor Cup races at Sheepshead Bay stated that Eddie Rickenbacher used a make of tire other than Goodyear. In fact, Rickenbacher, who came in second in that race, had his Maxwell equipped with Goodyears, which he also used in the race at Chicago on October 14.

STEAL 2571 AUTOS IN CHICAGO THIS YEAR.

Automobile thefts in the city of Chicago average nearly 10 a day and the police seem no nearer to a solution of the problem confronting their department than they were when the practise first assumed serious proportions a number of years ago.

So far this year a total of 2571 machines have been stolen and the insurance companies have paid out over \$500,-

000 for theft losses to owners. The stolen machines are of an average value of \$500 each, which brings the year's record up to \$1,250,000.

The police say one of the stumbling blocks in making prosecutions is the fact that when stolen machines are located, the purchaser generally produces a bill of sale and then it is up to the department to prove that the man knew that the machine he bought had been stolen. This is difficult, because the original owner of the machine having been reimbursed by the insurance companies loses interest in the prosecutions.

CARING FOR THE TIRE DURING THE WINTER.

Frank C. Millhoff, sales manager of the Miller Rubber Company, Akron, O., gives some timely and valuable advice to automobile owners in regard to caring for their tires during the winter. "Letting a car rest on the tires during the winter storage period is the most reckless way of throwing away good money I know of," he says.

"First of all the tires should be removed from the wheels and the outsides of the casings thoroughly washed with soap and water. This will remove all traces of oil. Then examine both the inside and outside for bruises and injuries. After making what repairs are

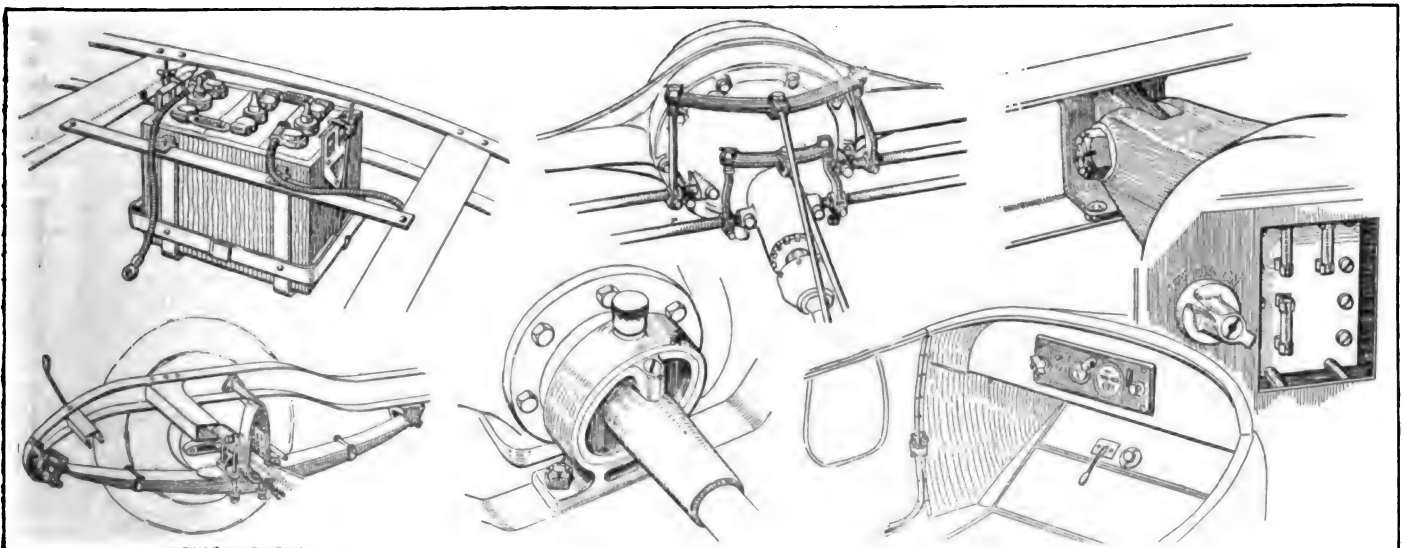
needed, wrap the tires carefully in a clean cloth—or preferably black paper—and then lay them flat in a cool, dark room. Then, too, the inner tubes should be removed from the casings and carefully cleaned off—then laid flat on a shelf in a dark, cool place. The chemists in the Miller factory advise me that the actinic rays of light are injurious to rubber, and lay great stress on the importance of keeping light away from your tires.

"If an owner should decide to leave the tires on the wheels, he should by all means jack up the car enough to take the weight off the tires and leave just enough air in them to keep them tight and in shape.

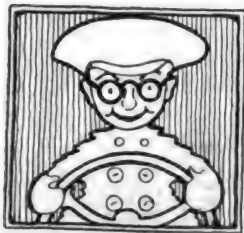
PITTSFIELD AUTO SHOW FOR NEXT FEBRUARY.

The second annual automobile show held under the auspices of the Company F, Second Massachusetts Regiment, in the State Armory in Pittsfield, Mass., will be held during the week of Feb. 19. James J. Callahan, who managed the show last year, will again have charge of the exhibition.

The annual banquet of the National Automobile Chamber of Commerce will be held at the Waldorf-Astoria on the evening of Jan. 9, during the week of the automobile show in New York.



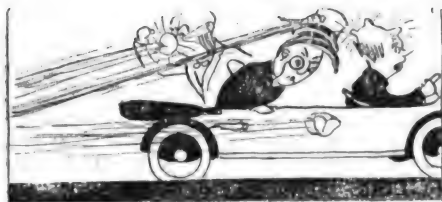
Details of Sun Construction—Left to Right in Top Row: Battery Suspended in Frame; Drake Equalizers; Front Motor Support. Bottom Row: Rear Spring Suspension; Left, Rear Motor Support; Details of the Instrument Board.



Graphic Items



Up in Maine the farmers' sons, having recently visited the county fairs and seen the many opportunities displayed to hit the "nigger in the head" and get a cigar, are testing their skill by throwing vege-



tables at the heads of passing motorists. It is admitted that true aim and a steady eye are needed in making a bull's eye on these rapidly moving targets, but with vegetables at their present levels the committee on conservation of food products should discourage the practise.

A jitney line has been established by the town of West Newbury, Mass., to compete with the Bay State Street Railway system. The action was taken to retaliate against the railway company for increasing the fare to six cents on one of the routes.

The municipal ferry boat, Hockomock, which operates on the Merrimac river at Portland, Me., carried over 12,000 automobiles during the past season.

Under the provisions of the Wisconsin Workmen's Compensation Act, according to a recent decision of the Industrial Commission of that state, the wife of a chauffeur who was murdered while working for a taxi cab company was awarded the full death benefit. The commission held that there was a special hazard of assault in such employment as watchman, game warden, bank cashier and chauffeur.

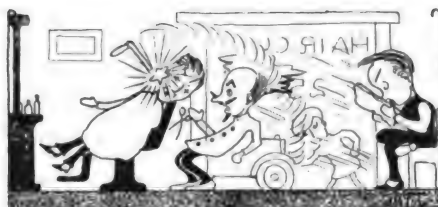
P. K. Wilson of Jacksonville, Fla., has the first Cole car ever shipped from the factory. It was called the "Cole 30 Flyer" and is still flying, giving its owner better than 14 miles to the gallon of gasoline.

One of the latest wrinkles in making money by means of an automobile is being employed by purveyors of popular music. They install a hand organ or



piano on the rear of a car and drive from city to city, accompanied by a singer, who renders the various selections to the accompaniment of the music.

Probably the only case on record where a man inside a building, 10 feet from the door, was almost fatally injured by a motor car, occurred in Providence, R. I., recently. The man was seated in a barber's chair when a starting handle from a heavy truck outside flew through the open door and struck him on the side of the head, inflicting a deep gash on his jaw and scalp. The driver of the truck explained the accident by the statement that the engine backfired and swung the crank off violently.



Ordinarily a skidding car brings little happiness, but as the old axiom goes, "It's an ill wind that blows no one good." A youthful couple of Bloomingdale, N. J., are now happily wedded as a result of such an accident. While eloping to be married they were pursued in another car by the girl's mother, who was bent on preventing the match. After leaving one minister's home, where the parent had stopped the ceremony, the couple



were on their way to another parsonage when the car in which the mother was following skidded and a rear wheel was broken off. Before she could obtain another and catch the couple the happy words had been pronounced and they were off on their honeymoon.

A youthful owner in Massachusetts, in emulating Hiram Maxim as a silencer inventor, nearly placed a spell of perpetual silence on his car and caused the perishable part of it to go skyward in smoke. In seeking a suitable material from which to construct a muffler, he made an initial error in tying a piece of old burlap around the exhaust. It proved effective, but only for a brief

period, the new device soon breaking into flames, which would have destroyed the machine had not an overzealous resident come to the rescue with a hose which he



did not seem to be able to turn off. In fact, the owner of the car wished it was a boat before he could prevail upon the volunteer fireman to desist in his efforts to drown him and the machine.

Elbert R. Robinson, a colored inventor, has filed suit against the Ford Motor Company for \$100,000,000, claiming that the automobile concern has infringed his patents on a core used in the construction of car wheels. The same man has also filed suits against several railroad companies claiming similar infringements.

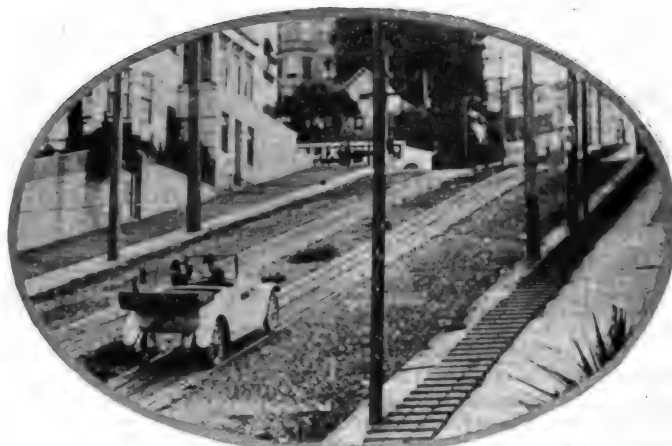
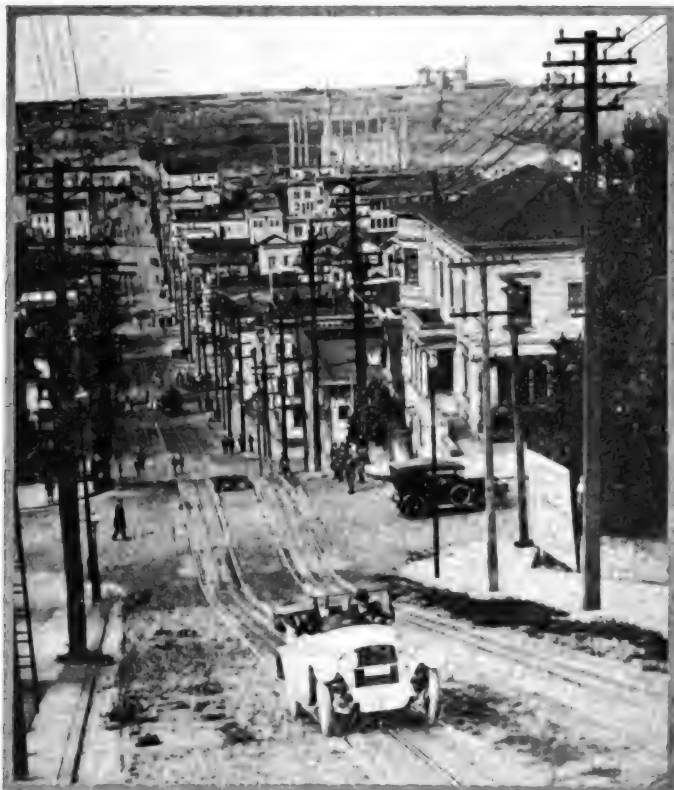
The State of Iowa, which has the largest number of automobiles per capita in the Union, also has the smallest number of illiterates. Here's a pointer for sociologists.

During the period between June 1 and Aug. 15 of this year 3768 automobiles, carrying 14,700 passengers, crossed the boundary line between the United States and Canada on the Pacific highway. No machines are permitted to cross between the hours of midnight and 7 a. m. A fee of 25 cents is charged for inspection of machines on Sundays.

At one of the New England state fairs during the past fall, where liquor is strictly prohibited, an ingenious native drove to the grounds each day in his car and parked it in an inconspicuous place, but the fact that a crowd of men were usually found about it and displayed an abnormal hilarity, aroused the suspicions of the authorities, who upon investigating found that the owner was dispensing liquor from the gasoline tank in the rear.



Up San Francisco's Steepest Hill In High.



In these two views a Ross Eight is seen ascending heretofore unconquerable Fillmore street hill in San Francisco, while locked in high gear, a feat that has never been accomplished before by a motor car. This hill is in the heart of the Californian metropolis and from its summit the whole of San Francisco lies spread out before the sightseer. Starting at Union street the grade to the next crossing, Green street, is $14\frac{1}{2}$ per cent. From that street to the next, Vallejo, the grade for the first half of the block is $24\frac{1}{2}$ per cent. and in the last half $25\frac{1}{2}$ per cent. From Vallejo to Broadway at the top of the climb it is 24 per cent. With J. H. Stelling of the Arnold-Stelling Company at the wheel and Ed Rainey, executive secretary of San Francisco's mayor, and official observer, the Ross car started the climb at 45 miles per hour and went over the crest of the hill at 20 miles per hour.

The Ross Eight Running in High Up Fillmore Street Hill, Which Pedestrians Have to Climb on Cleated Walks.

The feat of the Ross Eight is to be repeated and shown around the country in moving pictures.

Ferris Wheel Run by Allen Motor.

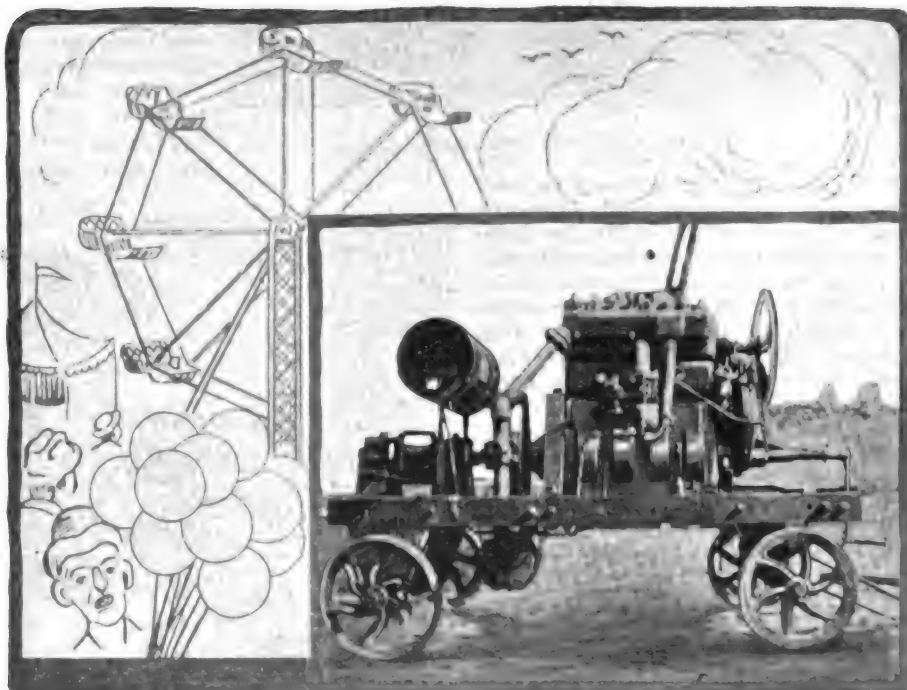
The Allen Motor Car Company recently learned that a motor from one of its cars has been employed to run a ferris wheel at country fairs and other exhibitions during the past year or two and despite the unusual conditions under which it is operated it has given a very satisfactory account of itself.

H. Wertalla, the owner of the wheel, in adapting the Allen motor to his uses had a portable frame built, installed a speed governor on the shaft and added a device to increase the water supply for cooling purposes.

METHODS OF PREVENTING WASTE OF GAS AND OILS.

The Bureau of Mines has issued a bulletin written by James O. Lewis and William F. McMurray on "The Use of Mud-Laden Fluid in Oil and Gas Wells." The authors discuss the enormous waste that has been occasioned by inefficient methods of controlling the gas and oil when wells are sunk.

"One of the most shameful wastes of this country's natural resources has been that of natural gas in the oil fields," the authors state, and they recommend the mud-laden fluid system as a means of preventing a continuance of the waste.



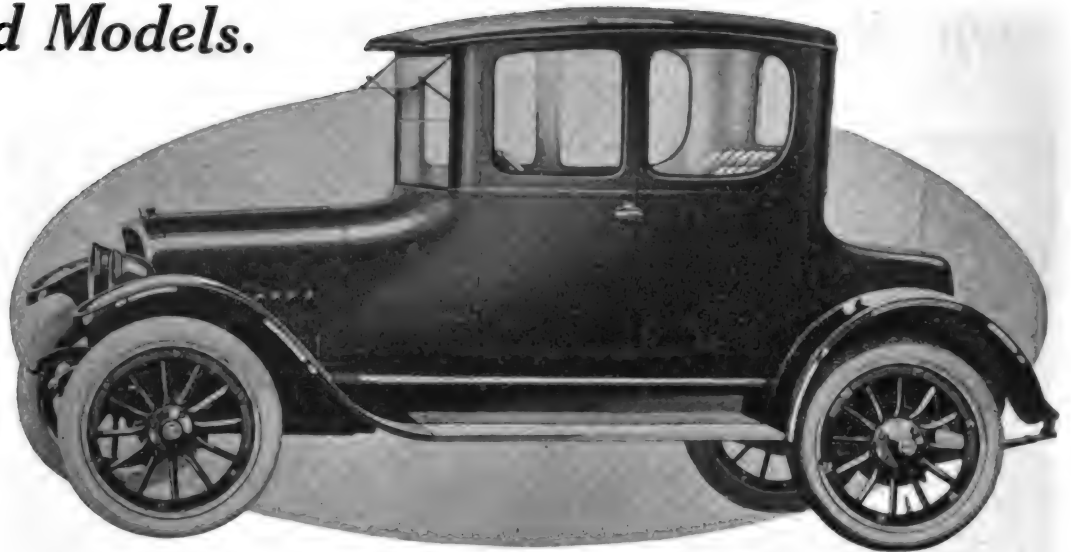
How the Allen Motor is Mounted on Its Carriage.

Allen Closed Models.

Convertible Coupe and Convertible Sedan on Allen 37 H. P. Chassis.

TO ITS already complete line of motor cars the Allen Motor Car Company of Fostoria, O., has added two closed body models, both being mounted on the dependable and standard Allen chassis. The new models are the Allen coupe, priced at \$1075, and the Allen convertible sedan, selling at \$1095.

Both are built after the characteristic Allen body design and are very striking



Allen Coupe Body on Four-Cylinder Chassis.

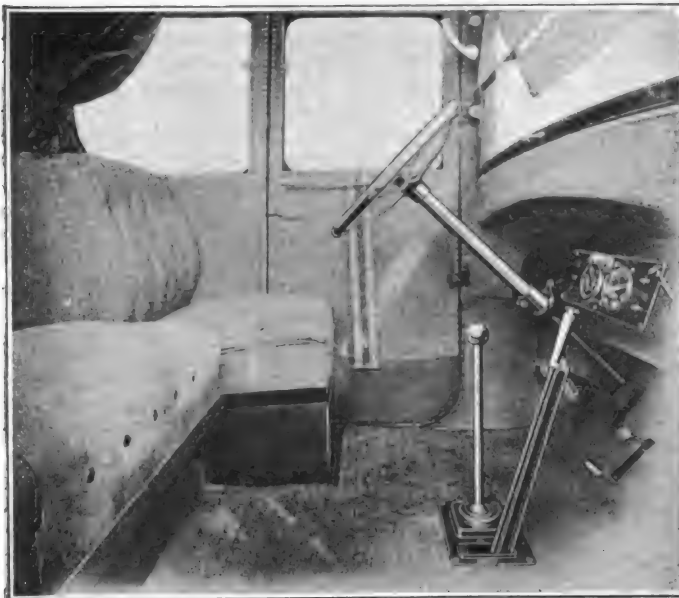
get greater ventilation by lowering the side windows, which sink completely out of sight and out of the way of the occupants. The full ventilating windshield is built for stormy weather, a visor over the top affording a clear vision ahead even on the rainiest of days.

The sedan is of the convertible type, in which the roof is permanent and of a very handsome design. Like the coupe, its interior finish is in gray, and illumination is by a centre dome light. Also like the coupe, all side windows are designed to be lowered out of sight when desired. The door pillars

are quickly detached by loosening thumb screws, and can be carried in a special small compartment at the back of the rear seat. For the convenience of ladies there is a six-inch space between the rear seat and the wall of the body, which allows them to lean back without crushing their hats.

There is ample room for five passengers in the sedan, divided front seats allowing passage between the front and rear compartments. The designers of the body have devoted much thought to the comfort of passengers and have made the seats high enough and at that angle that insures the maximum of riding comfort. The cushions are covered with gray Spanish Imperial leather.

The Allen chassis, on which these bodies are carried, has a 37 horsepower, 3½ by five inch, four-cylinder, en bloc motor, and has a wheelbase of 112 inches. The starting and lighting and ignition system is a two-unit installation. The fuel feed is by vacuum system and the gasoline tank is suspended at the rear of the chassis. The rear axle is a full-floating type and the springs at the rear are 55 inches long and underslung. The tires are 33 by four inches.

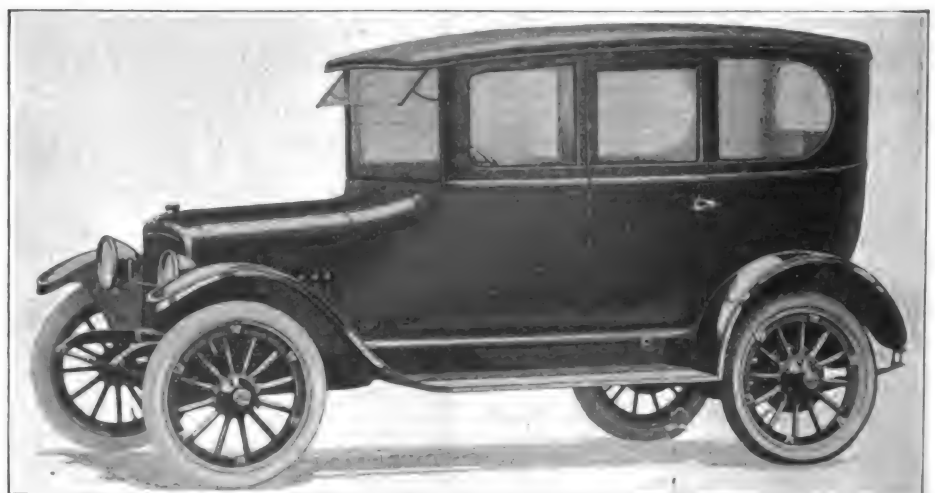


The Interior of the Coupe.

"jobs." The coupe is designed to meet every likely requirement of a three-passenger closed car, with interior trimmings in gray broad lace and dainty silk curtains. The gray color effect is carried out in the upholstery of the very roomy seats, which are in heavy all-wool gray whipcord. The floor is covered by a good grade of carpet, giving that touch of finished refinement which distinguishes the well made car. Illumination for the interior is furnished by a centre dome light.

On the outside the color scheme is blue and black, the body panels and hood being in the first named color and the top above the bead, the radiator and fenders in black. Further distinction is given the car by reason of the wheels being finished in a light cream color, which afford a striking contrast against the dark superstructure.

While primarily the coupe is a closed car, it is only the work of a moment to



The Allen Convertible Sedan.

**GREASE GUN.**

(Figure 254.)

A grease gun suitable for putting grease into transmission boxes, differential housings or steering gear casings, may be easily made from an old automobile foot pump, so-called. The first thing to do is to remove the brass shell or tube and out of this cut a piece about 12 inches long. Thread the inside of one end to take a solid piece of old brass about an inch or so thick, having one face flat and the other concave and having a $\frac{5}{8}$ hole drilled through its centre. Thread this hole to take the snouts, which are to be turned up approximately as shown and having holes drilled through their centre to suit the grade of grease you expect to use. It is well to have two or three of these holes, varying from $\frac{1}{8}$ inch up. These are turned taper form for convenience and threaded to fit into the base of the gun as stated. The other end of the shell is rolled over as a plumber rolls over lead pipe to make a butt joint. This facilitates the entrance of the plunger into the gun. For the plunger use the one that came out of the pump, replacing the old washer with a thicker one if necessary. The handle should be made smaller, or a more convenient one put on the rod, which should be cut to such a length as to project conveniently from the gun when pressed way down. To use the gun it is only necessary to remove the plunger and stick the tube or shell into the grease upside down when, upon withdrawal, it will be found to be filled. By using the snouts of different diameter holes this gun may be used for light or heavy grease or oil as desired. Not being enclosed and coming apart so readily it is easily filled and cleaned and being of brass will not rust or corrode.

ADJUSTABLE OIL FUNNEL.

(Figure 256.)

A handy adjustable oil filler can be made from an ordinary funnel and a section of flexible carburetor tubing, armored lighting cable or flexible brass horn tube. Cut off the tip of the funnel, as suggested in the sketch, and solder in its place a suitable length of the flexible tube mentioned. The free end of the tubing is placed in the oil reservoir, which is generally in a place difficult of access by the ordinary means, and the oil poured into the funnel. In this way oil is not spilled or otherwise wasted.

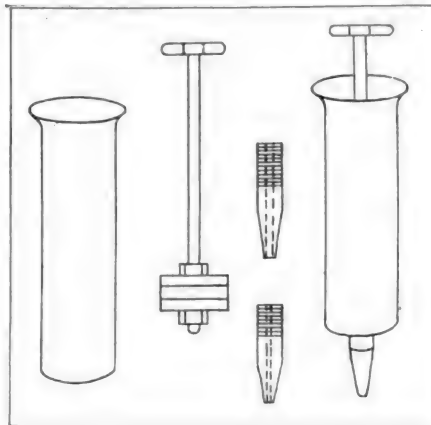


Fig. 254—A Grease Gun Anyone Can Make.

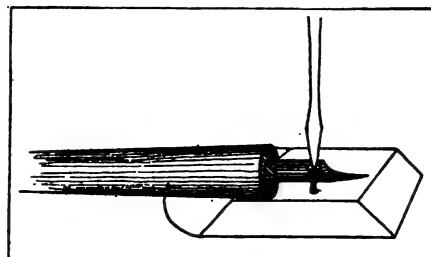


Fig. 255—Replacing Small Screws.

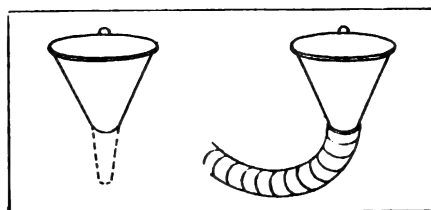


Fig. 256—Adjustable Oil Funnel.

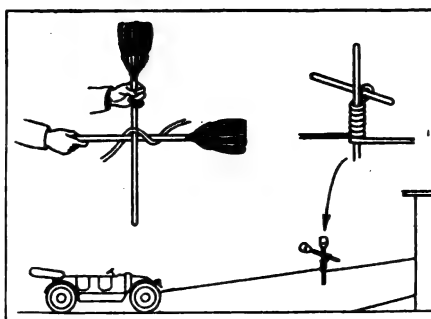


Fig. 257—Using Spanish Windlass.

REPLACING SMALL SCREWS.

(Figure 255.)

An old steel pen has its use in repair work, especially when replacing small screws in speedometers, magnetos, electric horns, etc. These screws are generally too small to be held in the fingers, in which case slip a screw into the slit or hole of the pen, which should be held in a penholder. In this way it is easy to start the screw.

USE OF SPANISH WINDLASS.

(Figure 257.)

A reader relates that he found his machine would not operate one morning and pushed it out of the garage to obtain more room in which to work upon it. He could not fix it, and could not obtain help to get the car back into the garage. In the emergency he adapted the principle of the Spanish windlass, as illustrated in our cut. He strung a strong rope from the car to a fastening at the rear of the garage interior, leaving a little slack. Next he held a stout stick vertically against the rope and passed another stick under the rope on one side and over on the other, pressing it against the first stick, as shown. The second stick was turned in a horizontal plane, the first being held steady in its vertical position. In that way a powerful pull was exerted, and the car drawn into the garage. It is well to remember when using this device that the rope windings on the vertical stick should be kept close together. The windlass moves toward the stationary object one-half as fast as the thing being moved, in which case the stick will be covered with rope before the object is obtained. In that case, block the car, release the windlass, take up the slack and proceed as before. There are many ways in which this device can be utilized.

SANITARY WASH STANDS.

(Figure 258.)

A wash stand equipped with an ordinary well to hold the waste which passes through a garage drain is generally troublesome and unsanitary, it becoming choked with mud and matter so that the waste will no longer flow out. If a bend, as shown in illustration, is installed the annoyance will be overcome. This will draw off the water from below the surface, preventing the solid matter in suspension from getting into the drain, but

causing it to settle at the bottom of the well, from which it can be removed easily. The bend, or elbow, is provided with a cap, D, which allows access to the drain for flushing purposes. As a further convenience a slight depression or valley, A, may be made in the floor just adjacent to the grated cover, C, which sets in the rim cover, B, so that the waste will settle there instead of passing into the well. The sediment can be removed periodically to a place in the open air where it will become aerified.

CHAIN DRAWER.

(Figure 259.)

What is more exasperating than trying to join the two ends of a tight chain? At times one needs several hands to hold each end, line up the holes and insert the pin at the same time. It is especially awkward when chains are in places not conveniently accessible. A handy little device which may be easily made to do this work is herewith illustrated. From soft steel stock $\frac{1}{4}$ by $1\frac{1}{2}$ inches cut a piece about six inches long. Draw a centre line lengthwise along the wide faces. About one-half inch from one end of this centre line drill a half inch hole. About $1\frac{1}{4}$ inches up from this bore a one-quarter inch hole from narrow face to narrow face and about $3\frac{1}{4}$ inches further up bore another one-quarter inch hole in a similar manner, being careful to drill true so the holes will be in the centre of the narrow faces. Now with a hack saw cut along the centre line you have marked. Cut a couple of pieces of one-quarter inch round stock about four inches long. Thread each up to within an inch of one end with some thread for which you can procure wing nuts. Set the unthreaded ends flush in one of the jaws and secure with small pins. The threaded ends put through holes of the other jaws and put washer and wing nut on each. You now have a handy little clamp useful for many purposes. To use this to tighten a chain spread the jaws apart and placing one in each end of the chain, allowing the roller of the latter to seat in the recess of the jaw to prevent slipping. By tightening first the top nut and then the lower one a powerful leverage will be obtained, which will hold the chain in position while same is being securely fastened together. Simply unloosening the wing nuts will allow the clamp to be removed.

HANDY TOOL BOX.

(Figure 260.)

A handy box for keeping together, ready for instant use anywhere, the most often used small tools and an assortment of nuts, bolts, washers and cotter pins may be made from a common box of convenient size, preferably with sides about $\frac{3}{4}$ inch thick. The most satisfactory one will be found to be of oblong shape. This should be divided into four parts by three partitions, as shown in the illustration, the centre partition having an opening cut in it for a handle.

Along the sides of this box and placed near the outside upper edges screw a long strip of strong metal having suf-

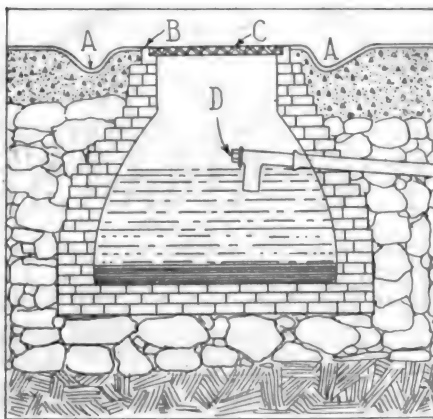


Fig. 258—Sanitary Wash Stands.

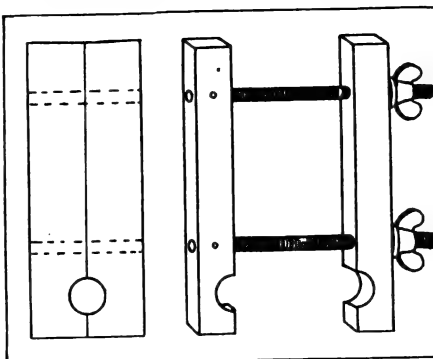


Fig. 259—Device for Drawing Chains.

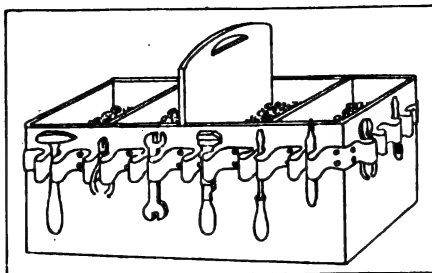


Fig. 260—Handy Tool Box.

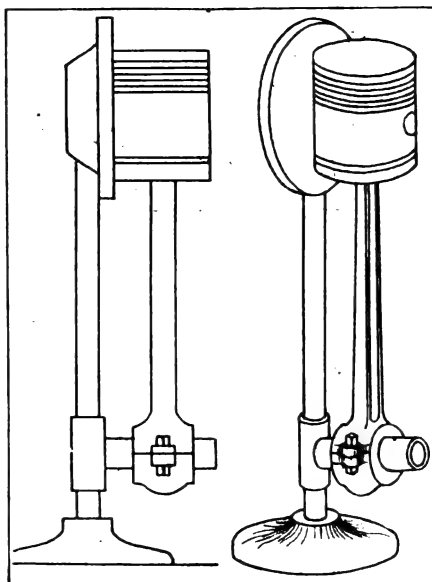


Fig. 261—Aligning Connecting Rods.

ficient spring in it to hold its shape if temporarily distorted. The kind used on the revolving rubber stamp stands, but a little heavier, will do. Pick out the few small tools you most often use for quick jobs and bend the strip of metal in shape so that each tool may have a place of its own around the box and may be easily removed by a quick jerk when in a hurry.

It is well to keep this little utility box always stocked and ready, having other tools for use at the bench or in the shop.

TESTING CONNECTING RODS.

(Figure 261.)

In installing new bearings in the connecting rods it is important to know that these are correctly placed in relation to the rod itself and the side of the piston. A jig for ascertaining this, similar to one used by one of the large motor makers, consists of a substantial stand, A, mounted on a bench or table, mounting a vertical shaft, B. To the upper end of this shaft is securely fixed a smooth and accurate face plate, A. Near the lower end is a short projecting shaft, D, of the exact diameter of the bearing of the crankshaft. Also the axis is exactly at right angles to the surface of the face plate. The distance between the parts C and D corresponds with that between the piston and the connecting rod bearing.

The piston and rod assembly is used complete. The bearing is clamped on the shaft, D, as it would be onto the crankshaft, and so that when rocked back and forth the piston just touches all or partly on the face plate, C. If the contact is perfect, the alignment of the bearings is considered to be correct. If the piston bears on the face plate on only one edge the alignment should be remedied. In some cases this, while not to be generally recommended, may be done by placing the rod in a vise and bending slightly through a long leverage until the alignment by trial becomes satisfactory. Of course the proper way, theoretically, is to have the bearings scraped in.

If the brake drums feel hot to the touch after an ordinary run the brakes are probably dragging. They should be adjusted so as not to be so tight as to drag, as this will use up considerable power. Jack up the wheels and see if they turn freely.

Files that have become dull and worn may be sharpened by letting them lay over night in a mixture of one part sulphuric acid and two parts water, afterwards rinsing and washing well in clear water. The acid should be held in an earthen vessel.

It is wise to occasionally examine the rear wheels for slack. A little wobble on the axle will soon wear the key or key seat into a dangerous wheel condition.

A soft leather washer placed between two iron washers will often serve to stop the rattle of fenders and brace rods.

SUGGESTIONS FOR THE FORD CAR OWNER.

Construction of the Coil Units and the Master Vibrator, the Manner of Connecting Them and the Tests for Efficiency—Restoring the Timer Brush.

The 69th article dealing with the operation, construction, maintenance, care and repair of the model T Ford chassis is the 20th of the series devoted to adjusting, restoration and overhaul.

These are the transformer coils, which, in the Ford machines, step up the current of from 14 to 18 volts to approximately 10,000 volts, this transformation greatly decreasing the amperage. The armature blades are two in number and these carry platinum contact points. The top of the core of the coil is directly under the lower blade. The movement of the lower blade may be limited by the adjustment of the upper blade, which can be set with an adjusting screw. When the core of the coil is magnetized and it becomes a magnet it attracts the lower blade and this breaks the primary circuit (from the coil through the timer and back to the coil through the magneto), and this break induces current in the secondary circuit, from the coils to the spark plugs, at high voltage that jumps the gaps in the spark plugs and causes sparks in the cylinders and fires the gas. The closing of the primary circuit by timer contact repeats the cycle and this is continued so long as the switch that connects the coils with the battery or magneto is closed.

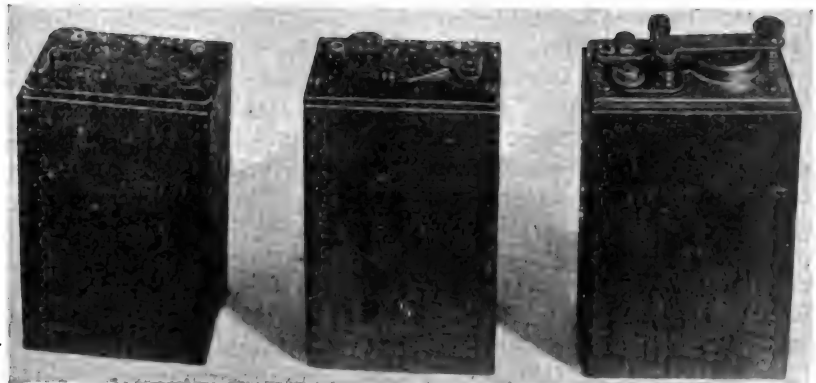
The wiring from the four upper or primary terminals of the coil is carried to the four terminals of the timer, and facing the dash from in front the coil terminals from left to right are number 1, 2, 3 and 4. The terminals of the timer are numbered counter clockwise, beginning with the upper left, in the order of cylinder firing, 1, 2, 4 and 3. The secondary terminals of the coil box are also 1, 2, 3 and 4 from left to right, and they are connected with the spark plugs of the engine cylinders in consecutive order, counting the cylinders from the front to the rear of the engine.

Testing the Coil Units.

To test the coil units they are taken from the box and laid on a bench. The test can be made with a battery of several dry cells, three or four being a sufficient number, with wire leads from the end cells, the cells being in series. The ends of the wires are touched to the bottom and upper back contact points, and the lower back contact point is touched to some convenient metal object. For the test when the illustration was made a hammer head was used. If the coil is in

good order a spark will be made when the lower contact is within 1/32 inch of the metal. If a spark can be made with such a gap the coil can be safely used.

There are several types of coils in Ford cars—that is, different makes—but all are similarly constructed and the test that has been described can be used for all of them. After the coils have been tested the terminals should be carefully examined and made clean and bright so that there will be good contact, for corrosion or a loose connection or chafed or oil-saturated insulation, or perhaps a broken wire, will cause the system to be partly or wholly inoperative. In the event that the wiring has been saturated with oil or grease one had best renew it rather than take chances. The spark plugs should be cleaned carefully, and



Types of Coil Units That Are Commonly Found in Ford Ignition Systems, There Being a Slight Difference in Construction of the Armatures or Vibrators.

good results will obtain by disassembling them and removing all soot and oil and brightening the points and setting them. The Ford instruction is to have the spark plug electrodes 1/32 inch apart, and they can be set by using a worn 10 cent piece as a gauge. This spark gap ought to be satisfactory as a rule, although in the event of weak current they may be closed slightly to meet the condition.

Adjusting the Coil Armatures.

After the engine has been started the adjustment of the armatures of the coil units can be made. The contact points—the platinum—should be bright and smooth so that they will contact their entire areas. The adjustment can be made by backing off the adjusting screw until the armatures cease to vibrate, after which the screws should be turned down until the contacts meet and the explosions of the cylinders are without a miss. Then the screws may be given a



Testing a Coil Unit on the Bench with a Dry Cell Battery Circuit Applied to the Primary Contacts and a Hammer Head Close to the Secondary Contact.

quarter turn and the settings will give good satisfaction. But the adjustments cannot be made unless the entire circuit is operative. In the event that there is a cylinder missing this can be determined by holding down two of the armatures, which will cut off two of the cylinders, and trying each combination, 1 and 2, 1 and 3, 1 and 4, 2 and 3, 2 and 4, and so on, and when the cylinder that is failing has been found the circuit can be examined to ascertain the cause. This means of testing the circuits is also illustrated.

The armatures of the coil units should be adjusted so that all of the cylinders fire alike. If there should be weak action of any one coil unit it may be changed to another circuit, and if there is no spark that will fire the cylinder and the armature will vibrate there may be coil defect. A large blue spark may indicate a leak of a condenser and should this be suspected the secondary wire terminal should be taken from the spark plug and held $1/32$ inch from the spark plug. If there is irregularity of the spark the condenser is probably defective. There is a small flat cushion spring under the armature bridge of the K-W coils that functions whenever the armature points make and break contact, and this should be operative. The spring action can be observed by taking the unit from the coil box and holding it so one can see its full length. Too great care cannot be taken in adjusting the coil units and having the fullest degree of ignition efficiency, for

the consumption of fuel and lubricant depends to a considerable extent upon the functioning of the system.

While many cars have four-unit coil equipment, there are those that are fitted with master vibrators. A master vibrator is designed to distribute the ignition current through a single coil to all four cylinders, and is regarded by some as affording greater ignition efficiency. In the event that a master vibrator is installed the four-unit coil is not removed. As the lower pair of terminals of a four-unit coil box are common, that is, both contact with a single contact member, the intention is that one be used for the magneto and the other for the battery connection. The coil switch when set is swung to the side on

which the terminal is in use—the magneto or battery—when the engine is started. But when there is a master vibrator one of these terminals is connected with the centre terminal of the vibrator unit. The coil switch must be permanently set to connect the terminal in use with the master vibrator, and the switch of the master vibrator is used in its place.

With the master vibrator installed many make a copper wire shunt between the terminals of the coil armatures so there will be direct circuit through the coils, but a much better method of making this circuit is by placing a piece of oiled card under each armature and turning the adjusting screw down hard, which will afford the desired result and there will be no need of fitting the shunts. The connection between the master



Testing the Efficiency of the Ignition System by Cutting Out the Coil Armatures by Holding Them Down and Listening to the Explosion of the Firing Cylinders.

vibrator and the coil is made by wiring connecting the coil terminal on the side that the coil switch is set to connect with the centre terminal of the vibrator. One of the side terminals of the vibrator is connected direct to the magneto and the other side may be connected with a battery of dry cells if this is used. The armature of the master vibrator is adjusted as are those of the coils.

Purpose of the Master Vibrator.

The purpose of a master vibrator is to have one adjustment for all four coils. It is an additional equipment and must be used in connection with the original four-unit coil. The intention is to have the explosions of the cylinders synchronized or uniform throughout, and this is accomplished, but there is just as much need of care in making adjustment of the armature of the master vibrator as there is of making the adjustment of the armatures of the separate coil units. In the event that a master vibrator is used the light wiring from the magneto should not be connected through the vibrator, but instead the light wire should be connected to the magneto contact, which will supply the current direct and obviate all complications. Very frequently, and as is shown in the accompanying illustration, the lighting circuit is connected to the coil box on the same terminal that the magneto is connected on.

In this case the wire from the magneto contact had been extended to the coil terminal that is usually used to connect the coil with the battery, but because of ignition trouble, probably from a defective contact, the change was made to the other terminal and the lighting circuit wiring was also connected to this terminal, thence through the dash switch and back to the lights. Were a master vibrator installed on this dash the lighting circuit wire should be connected to the magneto contact on the engine case.

Inspecting the Circuits.

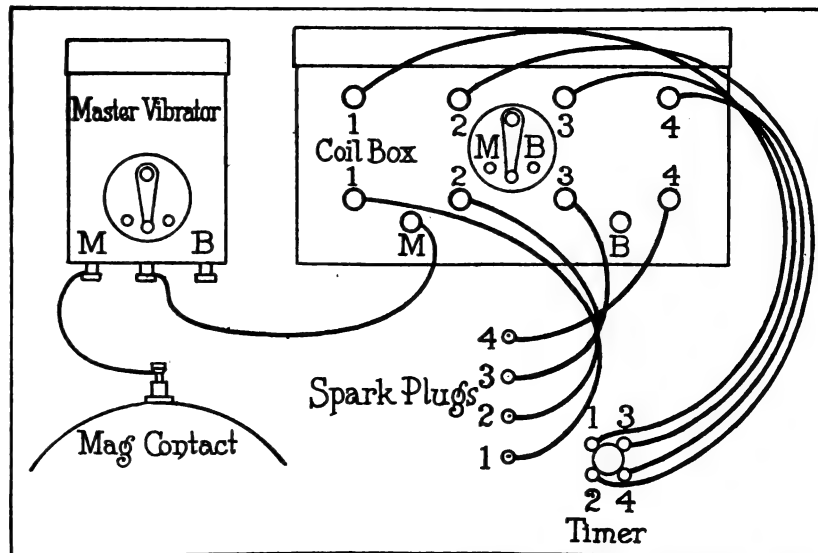
Too great care cannot be taken when inspecting an ignition and lighting circuit. All the terminals should be secure and firm. The metal should be bright. The wiring should be protected against exposure to water, oil or contact with any metal parts. The wiring should be taped where there is probability of wear against any object. Short wire leads that will not sag and swing are better than long leads, for there is less probability of chafing.

The transformer coils and the master vibrator, if the latter is used, should be firmly secured to the dash, so there is no movement of the boxes.

The terminals of the coils ought to be perfectly clean and bright. If old wiring is used this should be tested by feeling to know that the wires are not broken and by the battery to learn that its conductivity is not impaired. The terminals of the wires, if weakened, should be resoldered, and taped if necessary.

Restoration of the Timer.

The condition of the timer should be carefully observed. The brush or arm on the end of the camshaft, that revolves within the case carrying the terminals for the primary wiring from the upper series of coil terminals, turns at half the speed of the engine crankshaft and the roller on the end of the arm contacts with the fibre ring within the inner periphery of the timer case. In this ring are the contact pieces. The travel of this roller will gradually wear the ring, the ring wearing more rapidly than the steel contact pieces. The purpose of the pressure on the brush or arm is to insure contact with the steel



Sketch Showing the Wiring Connections When a Master Vibrator Is Used with a Standard Four-Unit, Coil-In Service, the Switch of the Coil Is Kept Permanently on the Magneto Contact and the Vibrator Switch Operated to Open and Close the Circuit.

segments in the ring.

There is an oil hole in the cover of the timer, through which lubricant is injected, and good judgment dictates that the timer shall be oiled about every 100 miles. The lubrication is thorough, for the oil is distributed by the brush roller as it is revolved about the timer case, but there should be sufficient oil at all times rather than an excess occasionally and a corresponding lack at others. But in any event the timer fiber and contacts and the brush will wear, and when the ignition system is examined care should be taken to restore the efficiency, which can possibly be done by renewing the fiber ring, or the ring and the contacts, or the roller in the brush arm, but the cost of complete renewal is so small that in the event of there being considerable wear this manner of restoration is recommended.

(To Be Continued.)



Accessories and Equipment



FEATHERWEIGHT PISTONS.

The maker of Featherweight aluminum alloy pistons declares that by substituting Featherweight pistons, which weigh only four pounds per set, for the iron pistons of the Ford motor, which weigh 12 pounds a set without rings and pins, there is obtained a gain of eight pounds in favor of the Featherweight pistons. This means a saving of a tremendous loss of power otherwise wasted with the standard iron pistons, the loss being at a rate of 350 tons per hour when operating the car in high gear at 20 miles per hour. It means a big reduction in vibration with the consequent saving of wear and tear on connecting rod and crankshaft bearings and throughout the whole chassis. The pistons, rings and pins are guaranteed to be properly designed, accurately machined to proper sizes and made of the highest grade of aluminum alloy piston metal, identical with that used by racing drivers. The pistons are fitted with individually cast rings of sufficient hardness to give maximum life and resiliency, yet not hard enough to score the cylinders, the tension being such as to absolutely prevent oil and compression leaking past. The use of Featherweight pistons insures decrease in vibration, fuel consumption, carbon deposit and repair bills, and an increase in speed and flexibility.

Manufactured by the Featherweight Piston Company, 11 Guyman way, Pittsburg, Penn. Ford type in four sizes with rings and pins, \$20 a set; Dodge type, any size required, with rings, \$25 per set.

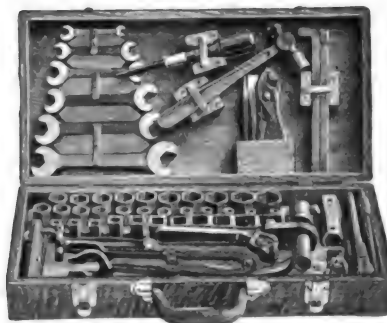
JIFFY STARTER.

The Jiffy mechanical starter is a simple device that fits over the end of the Ford crankshaft where the crank is attached. This is connected by chain and pulley to a hand lever on the dash board. A straight, easy pull on the lever imparts the same half turn motion to the crankshaft as does the ordinary Ford crank. Included with the starter is a positive primer. The operation requires only the placing of the foot on a small button. It can be installed by anyone. No vital parts of the Ford machinery are disturbed and the entire starter mechanism, except the hand lever, is completely concealed under the hood.

Manufactured by the Jiffy Starter Company, 427 Grand River avenue, Detroit, Mich. List price, \$10.



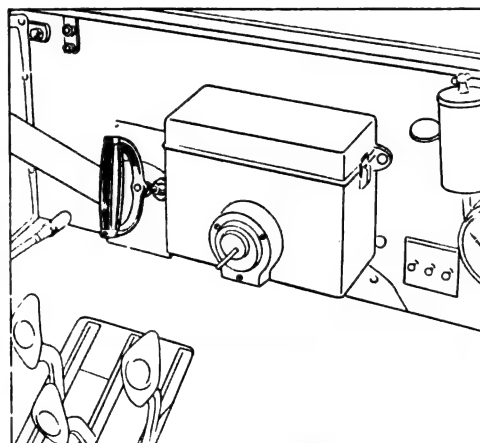
Keystone Westcott Wrench.



Champion Garage Kit.



Featherweight Aluminum Alloy Pistons.



Jiffy Mechanical Starter.

KEYSTONE WESTCOTT WRENCHES.

Aside from gasoline, lubricating oil and tires, there is nothing as essential to the proper maintenance and upkeep of an automobile as a set of good wrenches of the modern type and can be used with less exertion and more convenience than the old fashioned kinds. The Keystone Westcott wrenches, a line including a large variety of sizes and styles, are widely used by mechanics where good work and time and money counts. The adjustable S wrench, with a malleable iron handle and forged steel jaws, the leader of the Keystone products, is made in five sizes. The line also includes square sleeve and Morse taper ratchet drills.

The sizes and prices are as follows: 6", opens to $\frac{3}{4}$ ", 60 cents; 8", opens to 1", 75 cents; 10", opens to $1\frac{1}{8}$ ", \$1; 12", opens to $1\frac{1}{2}$ ", \$1.25; 14", opens to 2", \$1.75.

Manufactured by the Keystone Manufacturing Company, Buffalo, N. Y. Distributed by Surplus, Dunn & Co., New York City and Chicago.

CHAMPION GARAGE KIT.

This is a complete collection of necessary tools designed to meet the needs of anyone engaged in doing work on automobiles. The complete outfit consists of one improved steel ratchet wrench, steel extension bar, offset wrench handle fitting all sockets, nine-inch thin monkey wrench, six double end engineers' wrenches milled for U. S. and S. A. E. standard nuts and cap screws from $\frac{1}{8}$ to $\frac{3}{4}$ inches, 23 pressed steel hardened hexagon sockets, 11 pressed steel hardened square sockets, one drop forged universal joint, one double end spark plug socket, one pair six-inch combination pliers, 17-ounce combination peen hammer, screw driver and tire tool, besides a screw driver for heavy duty, a cold chisel, a punch, an "E-Z" valve lifter, an "E-Z" self fed drill ratchet and chain attachment for same and an "E-Z" cotter pin puller. All parts are carefully hardened and handsomely mottled. The tools are neatly packed in a case provided with locks and makes a handy portable outfit. The other tools and equipment made by this manufacturer are described in a catalogue which will be sent upon application.

Made by the Syracuse Wrench Company, Inc., Syracuse, N. Y. Price, \$18 the set.

THE OHMER TAXIMETER.

This device is designed for taxicabs, printing an itemized ticket showing the total fare in dollars and cents. The receipt also bears the date, serial ticket number, amount charged for extras, the meter number, the name of the taxicab company, instructions as to making complaints and, in fact, all the information a passenger is likely to desire. The meter also keeps a secret record of each transaction, embodying a duplicate of the passenger's slip, which is available only to the one holding the meter key. The device is set in operation by setting a flag in the "hired" position. Running at a rate of less than six miles an hour the charges are computed on a time basis, but if a higher rate is maintained the meter automatically computes on the basis of the established mileage rate. In case of accident or unavoidable delay the flag is set in a certain position and the machine apparently does not register. As a matter of fact it does record the time lost, which is printed on the secret record. The flag can be returned to the "hired" position by the driver at will, but it can be placed in the "for hire" position only after a ticket has been printed, which is done by turning a crank, making it mechanically impossible for the driver to avoid making a complete printed record of the trip. The taxicab driver is provided with a special key, which he must use before the machine will begin to operate; this key prints the driver's number on each ticket, which is a valuable feature.

Made by the Ohmer Fare Register Company, Dayton, O. Prices and further particulars upon request.



Ohmer Taximeter.

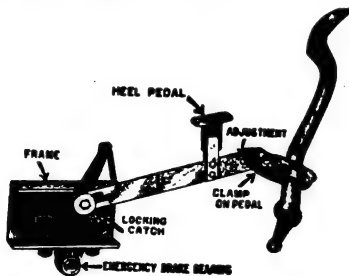


How Crew Levick Lubricants Are Displayed.

CREW LEVICK LUBRICANTS.

Crew Levick lubricants have been used by discriminating motorists since the year 1905, and now are recognized as standard for all uses in connection with motor cars. They are refined in the Crew Levick plants in Pennsylvania from the best of Pennsylvania crude petroleum obtained from the Crew Levick wells. A characteristic of these oils is that the carbon product does not take on the cylinders, it being produced in flake form and ejected through the exhaust. Crew Levick Motor Oil is produced in four grades, light, medium, heavy and extra heavy, while there are also Crew Levick gear compounds, cup and spring greases. Two other well known Crew Levick products are Mis'okleen, a spray cleaner, that polishes and cleans a large touring car and preserves and renews the varnish in 10 to 15 minutes at a cost of about three cents, and Grease-In-Tubes, consisting of tubes containing gear compound, spring and cup grease. Obtainable at most garages or direct from the maker.

Marketed by the Crew Levick Company, Land Title Building, Philadelphia, Penn. Prices: Mistokleen outfit, including Mistokloth, \$1.25; Grease-In-Tubes, three-tube outfit, \$1. Price of Motor Oil supplied upon application.



Clutch Control for Fords.



Evapco Gas Saver.

CLUTCH CONTROL FOR FORDS.

Shown in the cut is an attachment to be applied to Ford cars, giving to them in a manner some of the features of a selective sliding gear transmission in that it is possible to hold the gears in the neutral position without at the same time having tension on the brakes or requiring the use of the foot on the pedals. The device is attached by simply removing two bolts, requiring no machine work, drilling, tapping or fitting. When installed the movement of the pedal half way between first and second speed position puts it in neutral, where it will stay until released by a heel pedal conveniently placed to the foot. Further action of the speed pedal automatically releases this neutral attachment, making the clutch pedal work as usual.

Made by the New York Coil Company, New York, N. Y. Price, \$3.00.

EVAPCO GAS SAVER.

This device screws into the intake manifold between the carburetor and the cylinders, for the purpose of saving gasoline. It is a double valve arrangement that remains tightly closed when starting the engine and up to the time it is running smoothly. As the speed increases the valves open gradually, admitting more air to the mixture, thus regulating the richness of the mixture to obtain the best results. In climbing a hill, as the engine speed diminishes with the increase of load, the device gradually cuts off the air until finally it is supplying no auxiliary air. It is claimed that a saving of 77 per cent. has been shown by this device in a series of trials. It is easily installed by tapping a $\frac{1}{8}$ inch pipe thread in the intake manifold and screwing in the gas saver. There are no adjustments to be made to the carburetor or the device and the same size fits any style or size engine. It is sold with a money back guarantee.

Made by the Evapco Manufacturing Company, 427 Grand River avenue, Detroit, Mich. Price, \$5.00.

HAND-I-WASH.

Hand-I-Wash is a combination of soap, water and towel, combined in such a way that it can be easily carried, takes up very little space and sells at a price within the easy reach of every automobilist. It contains a full roll of best quality absorbent paper towels, and a tube of specially prepared washing liquid to be used without water, made from high grade vegetable oil and producing an abundance of lather. It cleans quickly without injury, leaving the skin in a clean, soft, and healthy condition, preventing chapping. It is also antiseptic and healing in the case of cuts and bruises. Hand-I-Wash is also applicable as a means of locating tire punctures.

Manufactured by Tay-Miller Manufacturing Company, Philadelphia, Penn. Price complete, \$1; refillers, consisting of towel roll and tube of liquid, 50 cents.



An Enterprising Arizona Owner of an Overland Touring Car Converted It Into the Racing Machine Shown Above and Successfully Competed in Races at Arizona County Fairs During the Past Season.

The Santa Monica Races.

Race Officials Declare Contests Will Be Held Despite Los Angeles' Veto.

The Vanderbilt Cup and International Grand Prize road races which are scheduled for Nov. 16 and 18 at Santa Monica, Cal., will be held notwithstanding the recent decision of authorities of Los Angeles that the races could not be run over the stretch of the course that lay within the city's limits.

E. E. Randall, manager of the contests, says it is possible to hold the races without going over the part of the course lying in Los Angeles and it will not impair the spectacular features of the races. There is a good list of entries, all well known speeders, and record breaking time for both events is anticipated.

THE SIGNIFICANCE OF TRANSCONTINENTAL RACES.

In the recent record-breaking dashes from the Pacific to the Atlantic owners of cars can find a lesson applicable to the equipment and operation of their own cars in every day travel. Early in the summer a driver named Baker crossed from San Diego to New York City in 11 days, 7 hours and 15 minutes. Soon after he lowered this record to 7 days, 11 hours and 53 minutes. Then Stevens in a Marmon took up the gage, running between New York City and San Francisco in 5 days, 18 hours and 30 minutes. His record stood for a while, until a Hudson car was sent between the two cities in 5 days, 3 hours and 31 minutes, returning to San Francisco in 5 days, 17 hours and 32 minutes.

The significance of these records concerns the equipment of the cars. It brings to mind the old axiom that a chain is no stronger than its weakest link, and as regards ignition these cars were no stronger than the spark plugs with which they were equipped. Unless these small factors deliver the all important spark with absolute certainty, millions of times dur-

ing the course of a run, high and continuous speed is impossible of achievement. All great racing drivers realize this and that is why they are so particular about which plugs they use.

Both track and transcontinental racing places the severest of tests upon spark plugs, and in the cross country runs referred to above it is significant that one brand of plugs was used on all the cars. These were A C plugs, made by the Champion Ignition Company, the president of which, Albert Champion, has spent many years and much money on costly experiments in bringing A C plugs up to their present efficiency. More than 60 of the prominent American automobile manufacturers today are using these plugs as standard equipment. They are used widely by racing drivers, and are giving general satisfaction on city streets and country highways.

"MASTER DRIVER" CONTEST HALTED BY RAIN.

The "Master Driver" contest held annually by the Chicago Automobile Club was halted at the end of the first day's run this year owing to the poor condition of the roads, due to the heavy rains that had fallen over the section where the run was to be held. Only two cars finished this leg with perfect scores, a Mercer and an Elgin.

ESTIMATED AUTO FATALITIES IN 1916.

Frederick L. Hoffman, statistician for the Prudential Life Insurance Company, in an address before the National Safety Council at its fifth annual congress at the Hotel Statler in Detroit, stated that fatal automobile accidents in the United States registration area have increased persistently from 6.5 per million in 1907 to 23.9 in 1911 and 59.3 in 1915. He said that the deaths by automobiles for this year are estimated at 5200.

COMING EVENTS

November.

Show, Providence, R. I. Nov. 10-18
Race, Santa Monica, Cal., Vanderbilt Cup and Grand Prize. Nov. 16 and 18
Race (Track), Phoenix, Ariz. Nov. 18
Race (Speedway), Los Angeles. Nov. 30

December.

Show, Springfield, Mass. Dec. 2-9
Celebration, National Electrical Display Dec. 2-9
Race (Speedway), Los Angeles. Dec. 25
Show, Cleveland, O. Dec. 30-Jan. 6

January.

Show, New York City Jan. 6-13
Convention, S. A. E., Mid-Winter Meeting at New York City. Jan. 9-11
Show, Montreal, Que. Jan. 13-20

Show, Cleveland, O. Jan. 13-20
Show, Buffalo, N. Y. Jan. 22-27
Show, Rochester, N. Y. Jan. 22-27
Show, Chicago. Jan. 27-Feb. 3

February.

Show, Minneapolis, Minn. Feb. 3-10
Show, San Francisco. Feb. 10-18
Show, St. Louis. Feb. 18-25
Show, Omaha, Neb. Feb. 26-March 3
Show, Newark, N. J. Feb.
Show, St. Louis, Mo. Feb.

March.

Show, Boston, Mass. March 3-10
Show, Fort Dodge, Ia. March 6-10

April.

Race (Road), Los Angeles to Salt Lake City. April

Packard Company Shows Big Surplus

Total Assets of the Company Were Announced as of Aug 31 to Reach \$33,644,658.79.

During the past year the Packard Motor Car Company of Detroit has increased its surplus by over \$6,000,000 and on Aug. 31 of this year had a surplus of \$5,381,486.04 after dividends had been paid.

The statement read at the annual meeting of the company recently showed that a total of \$2,847,648.76 had been written off for depreciation during the year and that the total assets of the company on Aug. 31 were \$33,644,658.79.

An increase in the authorized capital stock of the company from \$16,000,000 to \$21,000,000 was made during the year by the issuance of \$5,000,000 additional common stock. An issue of five per cent. gold debenture notes, amounting to \$3,000,000, are due on Dec. 1 of this year.

GHEENT COMPANY BUYS A NEW MANUFACTURING PLANT.

The Ghent Motor Company has purchased the Gay factory at Ottawa, Ill., and will immediately prepare it for production of a four and eight-cylinder car. The Ghent company has been building cars for a year and a half in Chicago.

PRICE OF STUDEBAKER CARS TO BE ADVANCED.

Announcement has been made by L. J. Ollier, vice president of the Studebaker Corporation, that the prices of Studebaker cars, both the four and the six, will be advanced from \$75 to \$100 over present prices, on or about Dec. 1 because of increased cost of materials.

WILLYS-OVERLAND OPENS NEW OFFICE BUILDING.

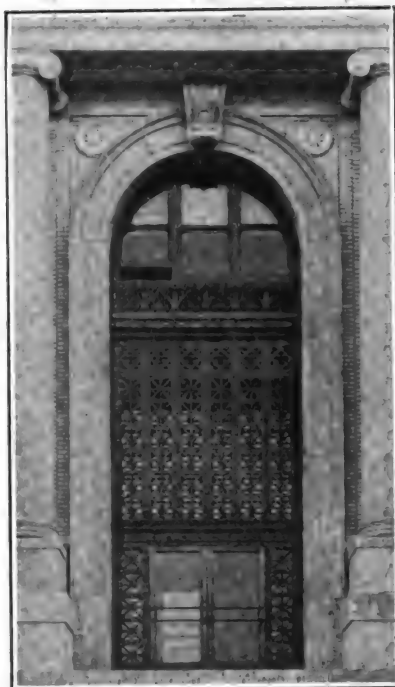
The new administration building of the Willys-Overland Company, one of the finest structures of its kind in the world, has been opened in Toledo, O.

The building is 63 by 375 feet, seven stories high, with more than 160,000 square feet of floor space. It is constructed of sand stone and brick, terra cotta and granite ornamental coping and trimmings. The shape of the structure affords excellent lighting facilities and the 588 odd windows fairly flood the big building with sunshine on clear days.

The main entrance is as impressive as the rest of the structure, large swinging bronze doors opening onto a lobby which is marked off by huge oaken columns. The accounting department is located on the second floor and on the third floor there is a girls' rest room, fitted with everything to provide comfort. There also is an emergency room which is a hospital in miniature.

On the fourth floor there is a dealers' reception room where the latest Overland and Willys-Knight models are displayed, and the fifth floor is devoted to the executive department, the office of President Willys and other officials being located there. The telephone headquarters of the entire factory and a telegraph office are located on the sixth floor and on the seventh floor there is a large auditorium with seating capacity for 600 people, and also a cafeteria and dining room for the office force, where meals are served at cost.

There is an automatic mail service to all floors and on each floor several messengers devote their entire time to distributing the mail matter among the offices.



The Huge Bronze Grill and Entrance Doors of the New Overland Office.

Raybestos Planning to Expand.

New \$1,500,000 Company Incorporated to Take Over Royal Equipment Company.

A \$1,500,000 company has been incorporated under the laws of the State of Connecticut to be known as the Raybestos Company, which will take over the Royal Equipment Company and all its interests in the manufacture of the well known Raybestos products, brake lining, brakes and other accessories.

The new company has acquired a 15-acre site at Bridgeport, where a plant consisting of six different buildings will be erected. The management of the business and its relations with dealers and jobbers will remain unchanged, as will also the business policy.

The new plant will consist of two buildings, 100x600 feet, for weaving lining, one building 60x200 feet for treating the lining, one building 60x300 feet for making compressed sheet, one building 60x200 feet for making brakes and a building 60x300 feet for a store house and shipping depot.

PRODUCTION HAS BEEN STARTED ON PRINCESS CARS.

The Princess Motor Car Company of Detroit, Mich., has started production at the rate of about 10 cars a day. The line includes three different body models, finished in five different color combinations. The power plant consists of a Golden, Belknap & Swartz engine with a Grant-Lees clutch and gear box. It is fitted with a floating axle and the wheel base is 108 inches. A Disco lighting and starting outfit is used and a Splittdorf-Dixie magneto for ignition. Two special features in the construction are a fuse box on the dash and the use of genuine leather in the upholstery.



New Administration Building of the Willys-Overland Company, the Finest of Its Kind in the World.

\$14,200,000 For Smith Company.

**Milwaukee Maker of Smith Motor Wheel
and Car Frames Obtains
Huge Capitalization.**

President L. R. Smith of the A. O. Smith Company, Milwaukee, one of the country's largest manufacturers of heavy parts and frames for automobiles and drop forgings, announced on Oct. 31 the consummation of plans whereby the Smith company's present capitalization of \$1,200,000 will be increased to approximately \$14,200,000 to provide for the expansion made necessary by the concern's huge business.

The plan embodies the issue of \$3,000,000 preferred seven per cent. stock and 100,000 shares of common with no par value, but estimated at \$100 a share, making the total capitalization with the present stock \$14,200,000. The following are to be added to the directorate: Mr. Lockhart of White, Weld & Co., New York City; I. C. Elston of Elston & Co., Chicago; Major C. C. Jamieson of Jamieson & Houston, New York. These men, together with C. K. Fankhauser of New York, a prominent financier, helped President Smith to put through the deal.

JONES COMPANY MAKES NEW ROADSTER TYPE.

The Jones Motor Company of Wichita, Kan., is placing on the market a four-passenger roadster on the six-cylinder chassis with the same wheelbase as the touring car model made by the company. The front seats are divided and the tonneau is finished with hand buffed leather. The price will be under \$1500.

EMERSON MOTORS COMPANY ACQUIRES NEW PLANT.

The Emerson Motors Company, which has a plant at Long Island City, N. Y., has acquired the factory of the Peckham Railway Car Truck Company at Kingston, N. Y., which has about 142,000 square feet of floor space and 70,000 feet of warehouse space. There is also five acres of ground included in the site which will provide room for expansion. Until the first of the year manufacturing operations will be continued at the Long Island City plant; but they will be transferred to the Kingston plant as soon after that date as possible.

INTER-STATE MOTOR COMPANY SUES RUTENBER MOTOR.

The Inter-State Motor Company of Muncie, Ind., has filed a suit for \$700,000 against the Rutenber Motor Company of Marion, Ind., charging the latter concern with breach of contract. It is claimed by the plaintiff that a contract was made with the defendant on July 30, 1915, providing for the delivery of 3000 motors during a specified time and that up to the

time of filing the suit only 379 engines had been delivered by the Rutenber Company. It is also claimed that a supplementary agreement was made on Nov. 11, 1915, fixing the minimum delivery at 5000 engines. The plaintiff also claims that on the basis of the agreed delivery it had made investments of approximately \$2,000,000 in other automobile parts and that orders were booked for 5000 automobiles.

FURTHER ENLARGEMENT OF H. H. FRANKLIN PLANT.

The Franklin Automobile Company of Syracuse, N. Y., has announced that since the present enlargement of the concern's plant was started plans for a further expansion have been decided upon and three extra floors to cost \$500,000, with machinery installed, will be added to the three-story reinforced concrete building at present under construction. This addition, which makes the fifth within a year, will bring the total floor space for manufacturing purposes up to 16 acres.

KETTERING WILL SPEAK AT METROPOLITAN S. A. E.

C. F. Kettering of the Dayton Engineering Laboratories Company will speak on "Some Present and Future Scientific Problems of the Automobile" at a meeting of the Metropolitan Section of the S. A. E. to be held at the Automobile Club of America, 54th street, New York City.

APPOINTMENT OF MORE BOSCH SERVICE STATIONS.

The Bosch Magneto Company has extended its service facilities by the appointment of 10 additional Bosch stations in different cities of the country. These have complete sets of special tools and testing apparatus and one or more men trained at the Bosch service schools.

The new stations are as follows: A. L. Ebbeson, Bangor, Me.; Auto Service Company, Bridgeport, Conn.; Wilson Electric Company, Jacksonville, Fla.; Harrington Motor Company, Mobile, Ala.; Garlock & Haynes, New London, Conn.; Auto Ignition Company, San Jose, Cal.; Essanell Electric Company, St. Paul, Minn.; Tonopah Electric and Tire Company, Tonopah, Nev.; Tri-State Garage Company, Uniontown, Penn.; Tourist Garage and Motor Repair Company, Wilmington, Del.

COLUMBIA MOTORS COMPANY TO MAKE LIGHT SIX.

The Columbia Motors Company, which recently acquired a plant in Detroit, where the Columbia light six, a five-passenger car, will be manufactured, will have machines on exhibition at both the National Automobile Shows in New York and at Chicago. The car is to be an assembled product and will sell at somewhere near \$1000.

Ford and Dodge In Litigation.

**Former Partners Get Injunction Restraining
Ford from Holding Up
Distribution of Profits.**

The huge earnings of the Ford Motor Company are again in the limelight, this time being involved in an injunction filed against Henry Ford to restrain the Ford Motor Company from carrying out certain expansion plans Mr. Ford has in mind and holding the company to its present limits.

The plaintiffs are John F. Dodge and Horace E. Dodge, stockholders in the Ford company and owners of Dodge Brothers. They want the accumulation of cash surplus distributed among the stockholders in special dividends.

The Dodge brothers were among the first backers of the Ford automobile concern and were interested in it up to the time they became competitors with their low priced car. Their original investment is reported to have been about \$10,000. They say they are not represented on the board of directors, which according to the bill is "dominated and controlled" by Henry Ford. The profits for the fiscal year ending last July are given as \$60,000,000, while the cash on hand amounted to more than \$52,000,000.

The petitioners state that Mr. Ford declared to them that stockholders of the company having received back more than they had invested and regular dividends of five per cent., they had no right to complain of his policies.

It is declared that Mr. Ford is now engaged in negotiations to purchase iron mines, build smelters and steel mills, "and by this means to deprive the stockholders of the company of fair and reasonable returns on their investment by way of dividends to be declared on their stock holding interest in the said company."

Another declaration is that after making 500,000 cars with a \$60,000,000 profit last year, notwithstanding the fact that this number could have been sold the coming year at the same price, "Henry Ford forced on the board of directors his policy of reducing the price of such cars by \$80 per car, making a difference in the net sales price of \$40,000,000. Such a policy was adopted only for the purpose of enabling him to continue to carry out the plan he had decided upon to extend operations."

The petition states that if Henry Ford is permitted to continue the policy he "is determined to carry out," the result will be the destruction of competition on the sale of this class of cars and the creation of a monopoly in the manufacture and sale of such cars in violation of state, federal and common law.

It is requested that a receiver be appointed to take charge of the business. The injunction already issued is temporary and the hearing on it is scheduled for Nov. 11. The industry is greatly interested in the outcome of the suit.

California's Accident Record.

During Three Summer Months 1103 Automobile Accidents Were Reported Within the State.

Will J. French, member of the Industrial Accident Commission of California, in an address before the league of California Municipalities, stated that there were 1103 automobile accidents in the state during July, August and September, which resulted in 258 deaths and serious injuries to 729 persons and minor injuries to 709 persons and no injuries to 825. There was an accident to each 172 cars registered in the state, and an average of 12 a day. Of the total number of accidents 33.4 per cent. were attributed to speeding; 104 to the result of confusion on the part of pedestrians; 84 to defects in the machines, while 51 were due to poor roadways. Twenty-six accidents resulted from the drivers being intoxicated and 20 from the glare of lights. Blow-outs caused 14 accidents, while the lack of lights on horse drawn vehicles caused 11. Two were caused by insufficient lights. The largest number of accidents, 688, happened in the cities, while 240 happened on the country roads and only 175 on the state highways.

WILL SEEK HIGHER THEFT PREMIUMS.

The Pacific coast delegates to the National Automobile Underwriters' Conference will endeavor to secure increased rates in California and other Pacific states, particularly on cheap cars.

Thefts have increased to such an alarming extent in that section that the increased premiums are thought to be imperative. During the month of September 125 cars, worth \$60,000, were stolen, and Arthur Keetch, special prosecutor of the Pacific Coast Automobile Underwriters' Conference, advocates the organization of a special automobile theft bureau in the police departments in conjunction with the sheriff's offices and the Underwriters.

SUPREME COURT PRAISES WORK OF ASSOCIATIONS.

In a decision recently handed down by the supreme court in a western state, the work of the motor organizations in urging safety in the operation of automobiles was highly praised. The comment as written in the court records is as follows:

"All must realize that this comparatively new and more dangerous method of travel which has become a permanent and essential factor in the life of the country, has imposed increased mutual obligations of care on drivers and pedestrians.

"The general and united action of automobile associations in urging upon members that safety should be the first consideration, is a hopeful indication

that these obligations will be increasingly regarded."

MILE POSTS FOR FEDERAL AID ROADS.

A concrete mile post, a replica in miniature of the Washington monument, will be erected on every mile of Federal Aid Roads constructed by the states in co-operation with the national government under the recently enacted Federal Aid Road act.

These posts, which will be set about three feet in height above the ground, will have iron plates embedded in one side, bearing the spread eagle national coat of arms and the letters "F. A. R." If the states desire to place an additional tablet on the posts they may do so. The number of the miles indicated will also be painted on the posts, together with mileage figures which might be deemed convenient for motorists. At the cross roads it is proposed to have the posts seven feet high and in the same form.

Logan Waller Page, director of the Office of Public Roads, who is sponsor for the mile post plan, is also working on plans

in co-operation with the state authorities for the erection of proper highway warning signals at sharp curves and grade crossings. Mr. Page states that wherever possible in building Federal Aid roads, railroad crossings will be eliminated.

CONNECTICUT EXPECTS REFORM IN AUTO LAWS.

There is considerable agitation in the State of Connecticut for new automobile legislation, and as a result it is expected that at the next meeting of the legislature a commissioner to handle the automobile department of the state will be asked for.

It is claimed by a number of organizations that the present statutes do not properly regulate the operation of auto-

mobiles and that as a result there is a serious condition of affairs in the commonwealth. The reforms urged include a law to definitely fix the speed limit, to regulate headlights and to require more strict examination of the qualifications of applicants for licenses to drive.

HEAVY VEHICULAR TRAFFIC ON FIFTH AVENUE, N. Y.

The Fifth Avenue Association of New York City recently had 14 expert comptometer operators take count of the number of vehicles passing up and down in the stream of traffic along Fifth avenue to determine to what extent the congestion on that thoroughfare at 42nd street had become increased. It was found that a total of over 25,000 vehicles, or 1000 more than was counted last year, make up the stream of traffic that flows



Clarence C. Baker and Family of New York City, Who Traveled 12,000 Miles Through the West Last Summer in a Chalmers Six-30 at a Total Upkeep Expense, Not Including Fuel and Lubricant, of \$37.50. In the View Above Mrs. Baker Stands in "Prohibition" Colorado and Mr. Baker in "Wet" Wyoming, with Little Baker "On the Fence" on Boundary Line Marker.

north and south, and west and east at this point in the big metropolis.

The object of the report was to show the necessity of having Park avenue opened all the way through by constructing a viaduct, and in this way relieve the heavy vehicular traffic on Fifth avenue.

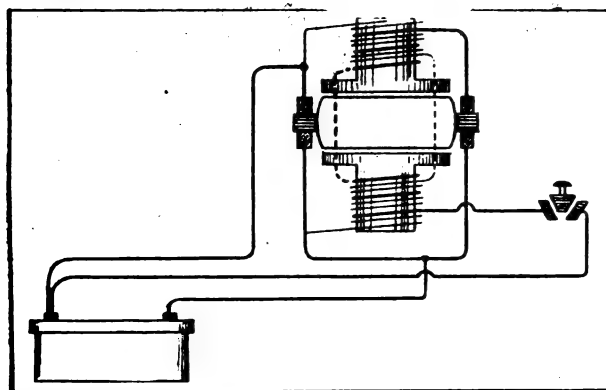
Between 3 and 4 o'clock, which is the rush hour along the avenue, more than 2500 vehicles pass 42nd street, or more than one a second, allowing for the fact that traffic is interrupted 20 minutes in the hour to allow for the passage of the east and west bound vehicles.

The Stewart carburetor installation for Ford cars is the subject of a new and attractive folder issued by the Detroit Lubricator Company, Detroit, Mich. A copy will be mailed free upon request to the company.

MOTOR STARTING AND CAR LIGHTING.

How the Current is Collected and Distributed Through the Circuits—Importance of Polarity and How Terminal Relations Can Be Established.

THAT there may be complete understanding of the windings of motors and generators the theory of the reversed series wound machine may be further stated. The main difference in this construction as compared with any others is that the current sent through the field coil moves in a direction opposite to the current sent through the shunt coil. The influence obtained is that of reducing the strength of the magnets, because all of the current that is sent out of the armature goes through the series winding, opposite to that sent through the shunt winding, which makes the strength of the field poles correspond to the ampere turns of the shunt coil. The effect of the series winding is to increase the voltage and the ampere output proportionate to the increase of speed. But as the current production is increased there is increase of the opposition of the series winding current to the current in the shunt field



Compound-Wound Motor-Generator: Commutator at Left Side with Shunt Field Winding Connected to the Brushes Affords Conventional Shunt-Wound Dynamo Action for Generating Current; Commutator at Right Side for the Starting Motor, the Current from the Battery Passing Through the Starting Switch to Excite the Series Field Winding.

or coil, which lessens the magnet strength and decreases the current production. In other words, this construction affords a balancing of current output that may be established at a specific point.

There must always be two, or multiple of two, poles in any machine, and one or a series of these will always be positive or negative. In some machines there may be, for instance, four poles, two of which are wound and two unwound. One of these wound poles will be negative and one positive, and there will be the same difference in polarity with the unwound poles. The unwound poles are usually known as commutating poles, the purpose of these being to prevent or lessen the probability of sparking at the commutator, and in machines of considerable size these com-

mutating poles are well nigh universally used.

Number of Poles Variable.

The machines ordinarily utilized for producing current for starting and lighting systems have from two to six poles. That construction that minimizes the number and yet obtains good operating efficiency has simplified its design because it has lessened the degree of attention proportionate to the simplification. Some of the manufacturers of the small generators and motors have designed machines with two poles, only one of which is wound. The unwound pole is termed a consequent pole and it is of opposite polarity to the wound pole. By this is meant that if the wound pole is positive the consequent pole will be negative, and vice versa if the wound pole is negative.

As has been pointed out, there must be as many brushes as there are main poles, or the main poles of like polarity may be coupled so that there are leads from each group to the brushes. There must be two brushes and there may be four or even more if the proportions of the machine demand them. By this is meant that one of the characteristics of design is that one set of brushes will always be positive and one set negative, so there will always be positive and negative terminals. But in the event of there being a reversal of the current through the circuits there will be a corresponding reversal of the polarity of the brushes. The flow of the current when starting is determined by the direction of the flow from the armatures into the brushes, and the flow from the armature is dependent upon the direction of flow between the field magnet poles. In other words, the relation is established by which the poles are positive and which are negative. The polarity of the poles is dependent upon a definite degree of magnetism if the shoes are permanent magnets, or by residual magnetism if the pole pieces are not magnetized.

The Initial Flow of Current.

The machines are usually built for definite purposes and the armature rotates in one direction whenever used. The soft iron of the pole pieces will retain a slight degree of magnetism when the machine is idle, which will be the same in polarity as when operated, and this will cause a flow of a weak current through the armature when rotated, which will be increased. That is, the weak current flowing through the armature will create a low voltage and small amperage, which will further energize the fields, and the current will be "built up" to the maximum in a very brief time.

But if the flow of current around the field coils should be reversed from the original polarity the residual magnetism would be of the opposite polarity and would flow in the opposite direction to the normal flow and the terminal polarity would be changed when the machine was again started. By this is meant that the terminal that was positive would be negative and that which was negative would become positive, and in the event of this condition obtaining a charging current would be reversed in the battery, which would be extremely dangerous and would probably damage the plates.

Reversal of Polarity.

There are generators so designed that the polarity is changed to that of the battery when the cut-out is closed for the first time, and the connections can be placed without reference to the polarity of the battery or the generator. When the generators have permanent field magnets these are installed according to the design and the terminals and brushes will have polarity with reference to the location of the positive and negative brushes and their relation to the armature. The polarity of the terminals and brushes can be changed by reversing the position of the magnets. The flow of current from the battery will not affect the fields, because it does not pass around or influence them as in the electromagnetic type fields, but a reversal of the flow of the current would undoubtedly weaken the magnetism of the magnets to a greater or less extent, the degree depending upon the period of the flow of current.

In the event that the polarity of terminals are not known these can easily be determined by attaching lengths of wire to them, the ends or terminals of which are bared. In a glass of water a quantity of salt can be dissolved, or strong vinegar added, or, better still, if electrolyte is available a small quantity can be used. The free ends of terminals of the wires from the terminals can be placed in the solution. Both wires will be observed to throw off small bubbles, and the greatest number will indicate the negative wire and terminal. There may be bubbles from but one wire. The ends of the wires need not be separated in the solution more than a half inch and perhaps results can be obtained with even less separation. Incidentally, this test can be applied to any battery or generator that is creating current.

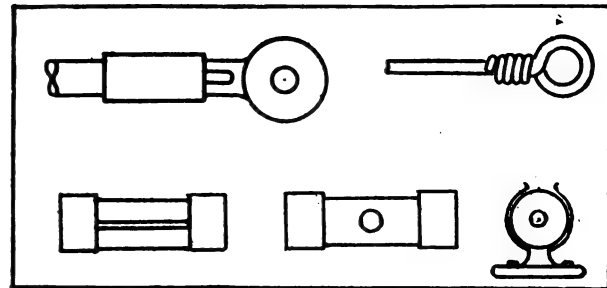
Should test determine that the connections have been reversed they should be replaced as they were originally, with the positive terminal of the battery connected to the positive terminal of the generator and the negative terminal of the battery to the negative terminal of the generator. The battery should be completely charged. The cut-out should be closed two or three times for two or three seconds, and in the event of the cut-out remaining closed (which may happen if it

is electromagnetic) it will open if the engine is started. The flow of the current through the generator will restore the polarity of the generator terminals.

Examination to Find Defects.

The car owner or driver who has not experience with electrical construction and is not versed in electrical principles should not undertake to make changes or even repairs aside from those of a simple character, like replacing broken wiring or defective wire terminals, because he may be in serious error and cause more or less damage to the system. There is a good deal of care, however, that can be given that will maintain efficiency and will obviate annoyance and discomfort.

In the event that there is failure of the system or any part of it to function the cause should be sought, and this may be a loose or broken wire or connection. If the current cannot reach the negative side of the source, either battery, generator or motor, the wire will be dead and there is no current flowing in the circuit on either side of the place of interruption. The greatest cause of failure or trouble may be said without question to be incompleting circuits, where there may



Terminals and Fuses: Above is a Standard Type Copper Terminal, Soldered to a Cable, and a Terminal Formed from the Cable; Below are Shown the Glass Tube and Paper Tube Fuses, and a Typical Fuse Clip.

be one side or part of the circuit installed and the remainder not installed. If the system is complete it will show evidences of activity when simple tests are made.

(To Be Continued.)


THE 1917 AUTOMOBILE SALON.

The 1917 Automobile Salon will be held in the grand ball room of the Hotel Astor, New York City, and for the first time in the five years this exhibition of high grade cars has been held in that hostelry the balcony overlooking the ball room will be used for exhibition purposes also.

Though definite figures are not available at this time, the management is assured that this year's Salon will surpass those of past years. There will be a dozen or more high grade American and European models on the main floor and from four to eight in the balcony. Tire and accessory exhibits will be located in the promenade at the rear of the main floor.


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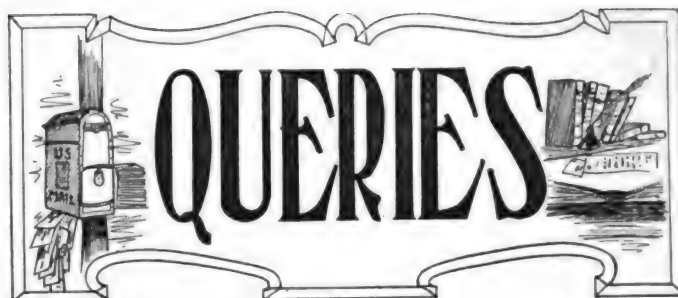


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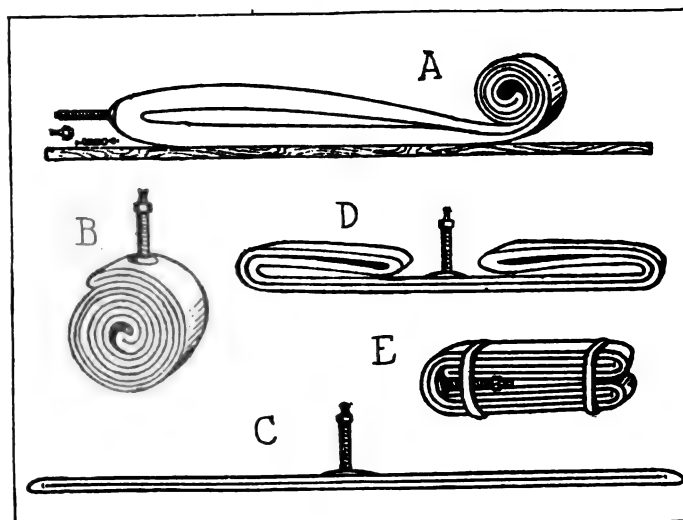
THIS department contains the Mechanical Editor's answers to readers' inquiries. It is open to every subscriber. If any part of your car is not operating satisfactorily, or if you desire information regarding operating, maintaining or repairing motor cars, do not hesitate to lay your troubles before him. He will answer promptly and fully, either by mail or in these columns, as you direct. This service is free to every subscriber, and is often the means of saving considerable money that otherwise would be spent with a garage man. Letters should always be signed with the writer's full name and address, and the car or part in question should be properly identified, by mentioning the maker's name, model, year of production or other distinguishing feature. Address all inquiries to the Mechanical Editor.

PROTECTING EXTRA TIRES.

(E. G. B., Indianapolis, Ind.)

As tire manufacturers and persons repairing same say to keep tubes protected and free from chafing when carried as extras on the car, will you kindly state in your Journal a good method of doing this? I have done as advised by a tire repair man and taken out the valve of my tubes and rolled them up, but even so am unable to get a very small bundle out of it.

You have been advised correctly. In fact it is absolutely necessary to keep extra tubes well wrapped up and protected from rubbing against other articles in the tool box which might chafe the tube or cut into the edges of same. A very good method to follow in doing this and the way that is usually done is as follows: First, remove the valve insides from the tube and flatten the latter out so that the valve stem will be at one end. In this position commence at the other end and roll it tightly towards the valve stem as shown in A, until it is rolled as shown in B. Now, being sure that all air is out of the tube, replace the valve insides so that no air will enter. The next thing to do is to flatten the tube out again, but this time with the valve stem in the centre as shown in C. Beginning at either end fold the tube over onto itself once as shown in D and then fold both sides onto themselves with the stem in the middle as shown in E, holding in place with a couple of elastic bands. To carry this in the tool



Proper Method of Folding Tubes for Storage.

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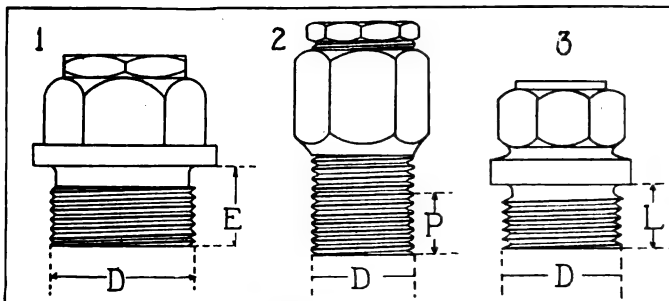
box or in any place where there is a possibility that it will come into contact with other objects it should be wrapped up. Preferably this should be done first in a newspaper and then all wrapped in a strong cloth, being tied together with a string or piece of hemp. This will keep the tube dry and clean and also be a great protection from chafing. If there is a hole or puncture or other opening in the tube of course it will be impossible to roll the tube up tightly as herewith directed, as the air will enter the tube as fast as it is forced out. In fact, this will probably answer your implied question. You probably have been unable to wrap your tube up tightly because as soon as you had forced all the air out of the tube you did not replace the valve insides, which is essential.

A. C. CHAMPION SPARK PLUGS.
(H. K., Cleveland, O.)

I am interested to know what "A. C." stands for on the Champion spark plug; and also how many different style threads are used on spark plugs? Could you make a sketch of them in the next issue of The Automobile Journal?

"A. C." is a trade mark that was originated by Albert Champion, who first manufactured the Champion spark plugs, it being the initials of his name. These plugs were first made in Boston and later the factory was established at Flint, Mich.

There are three types of spark plugs commonly manufactured commercially, the one being known as the $\frac{1}{2}$ -inch pipe size, the second the metric and the third the S. A. E. standard. From the accompanying sketches one will note the characteristics of each type. With reference to these, spark plug diam-



Three Types of Spark Plugs: 1, S. A. E. Standard Size; 2, $\frac{1}{2}$ -inch Pipe Size; 3, Metric Size.

eter is assumed to be the size of the shell. The following specifications are sufficiently clear:

One-half-inch spark plug sizes—D, diameter at end, .815 inch; P, length of thread, $\frac{1}{2}$ inch; taper, $\frac{1}{4}$ inch per foot; threads, 14 per inch, V form, slightly rounded at top and bottom, depth .057 inch.

Metric size—D, diameter, 18 millimeters (.708) inch; L, length of thread, about $\frac{3}{8}$ inch straight, no taper; threads, 1.5 pitch (about 17 per inch), V form.

S. A. E. standard—D, diameter, $\frac{7}{8}$ inch; E, not less than $\frac{1}{2}$ inch; F, not more than $\frac{1}{4}$ inch; length of thread not less than $\frac{3}{8}$ inch, straight, no taper; threads, U. S. standard, 18 pitch.

OILING SYSTEM OF OLDSMOBILE DEFENDER.

(J. T. C., Attleboro, Mass.)

Would you explain the oiling system of the Oldsmobile Defender, model 1912? The system I wish explained has a pressure gauge on the dash, no splash and all bearings have small pipes leading to them. What produces the pressure that forces the oil through the leads? I do not see any pump.

This system has a plunger pump that is driven by a cam on the camshaft, that is operated much the same as a valve tappet. The pump plunger is lifted by a spring and is forced down by the cam as it revolves. The pump is located on the left side of the engine case at the forward end, and if you will look into the oil filler you will note a screw slightly below the top. This screw adjusts the pumpage, as seating it increases the volume of oil forced by the pump each revolution and unseating it (backing out the screw) reduces the

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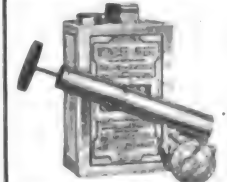
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volume. Wide variance can be made in the volume of oil pumped by turning the adjusting screw. The pump itself is attached to the lower section of the engine crank case, and is removed when the lower section is taken off.

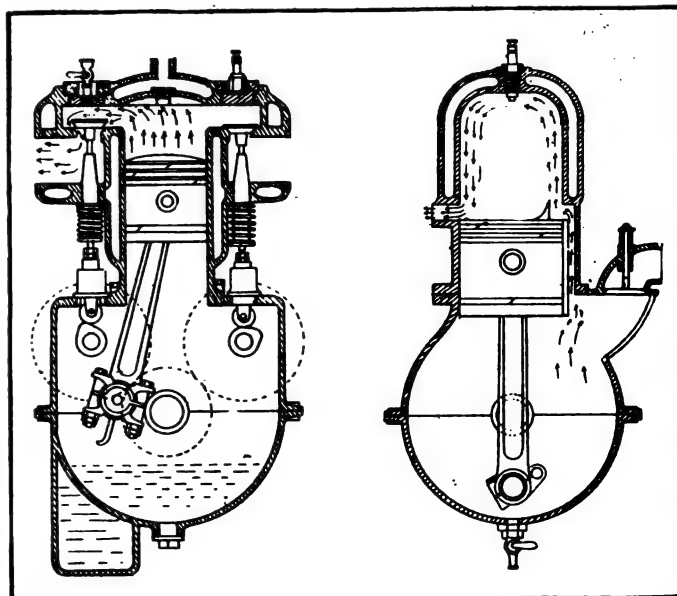
From the pump, of course, the oil is forced through the different leads and through the system to the different main points of lubrication. Considerable oil is thrown off and distributed about the interior of the engine by the centrifugal force of the revolving crankshaft.

TWO-CYCLE ENGINE IN MOTOR CARS.

(A. B. M., New London, Conn.)

I have often wondered why the manufacturers of cars do not use two-cycle engines more generally. I do not see why they cannot be used. Probably you can explain.

Two-cycle engines are ideal for some purposes, but for use in a motor car they cannot be compared to the four-cycle engine for efficient operation. To secure the greatest measure of power and smooth operation from either type, it is necessary that the operations of admitting a fuel mixture of proper proportions to the cylinders, compressing it by the piston and then igniting it should take place at exactly the predetermined time. It is also essential that before the next fresh charge of fuel is admitted the burned gases of the preceding



At Left, Through Section of Four-Cycle Engine; at Right, a Two-Cycle Engine.

charge should be ejected and the combustion chamber be comparatively clean of them. In the two-cycle engine these operations must take place in half the time that they do in the four-cycle type when both are operating at the same speeds.

Probably the chief objection to the use of the two-cycle engine in motor cars lies in the fact that it has no adequate means of exhausting the burned gases at rapid speeds. The exhaust stroke, which is lacking in the two-cycle design, is one of the important features of the four-cycle type, as it forces out the old charge and leaves a clear chamber for the new gas to enter.

Because the two-cycle engine develops a tendency to choke because it cannot fully expel the burned charge, it cannot attain the high speeds possible with the four. This is clearly demonstrated in the accompanying sketch, showing both types of motors and how they operate. The two-cycle type is shown with the piston at the end of the power stroke, the exhaust and the intake ports being open. It will be seen that the burned gases must be exhausted simply by its own pressure, excepting for a slight assistance from the incoming mixture. The four-cycle engine is shown with the piston going up on the exhaust stroke, thereby affording a positive pumping effect by which the burned gas is ejected.

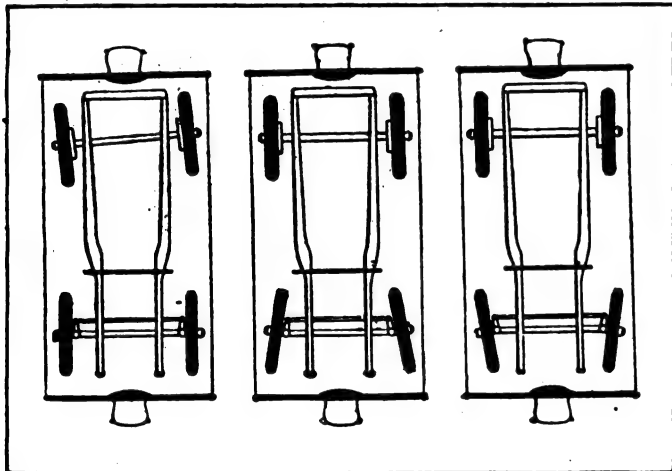
If this were the only objection to the two-cycle design it might be overcome satisfactorily by enlarging the ports. However, it is imperative that there be no mixing of the fresh gas with the burned and that too much pressure must not be exerted in expelling the old; if they did mix an appreciable amount of good gas would pass out of the cylinder before being used for power. Further, it is essential that the burned gas shall have lost a greater part of its heat before the new charge enters, inasmuch as it would be liable to cause pre-ignition.

TESTING ALIGNMENT OF WHEELS.

(W. S. W., Philadelphia, Penn.)

I recall that some time ago, probably more than a year, you published in your magazine a suggestion for determining the alignment of wheels by using two strips of wood and some string. I can't find the copy in which this appeared and would appreciate your printing it again.

The device and method to which you no doubt refer is illustrated by accompanying sketch and the following explanation. It consists of two pieces of wood each measuring about seven or eight feet in length and two pieces of heavy cord, each about 15 feet long. In each end of each strip of wood a hole should be drilled, the holes being exactly equidistant from the exact centre of the length of the strips. Place the strips of wood on rests at the front and rear of the wheels, as shown in sketch, and join by passing the cords through



The Rope and Stick Method of Testing Alignment of Wheels.

the holes. The whole assembly should be adjusted so that one of the cords is exactly parallel with one of the rear wheels.

To determine this the distance between the string and the rim of the wheel should be measured—do not measure to the tire, for it varies at different points. If the other rear wheel should not be parallel with the other cord, it is probable that the rear axle is bent, the wheel is out of true or the axle may have been shifted along the spring. In the case of chain driven trucks, it is possible that the tension of the chains may have become unequal and one radius rod is longer than the other.

To test the front wheels they should be set parallel with the cord, which should be in alignment with the rear wheels. As wheel rims may vary at different points, it is advisable to give each wheel a quarter turn and then repeat the measurement. The method is illustrated in the sketch.

GENERATOR RUNS BACKWARD.

(L. D. R., Pittsburg, Penn.)

1, explain why a 1914 Cadillac generator runs backward when mercury tube is removed or broken down; I mean when the generator runs as a shunt field motor. 2, why are the shunt and series field windings of later model Delco generators on one pole; in older types both poles are wound. 3, explain the difference between a high and low speed generator.

Cannot account for a motor-generator such as you specify

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Write or wire.

BRISCOE MOTOR CORPORATION, 157 Leroy Ave., Jackson, Mich.



SOUTH SIDE OF POST ROAD,
ONE AND ONE QUARTER MILES
WEST OF FLANDERS, CONN.

being driven backward in any circumstance without the removal of the rolls of the generator clutch, which would wedge in the event of turning the armature in reverse if in the clutch. The mercury tube you refer to probably means the mercury well regulator, which is on the charging side, and when generating current interposes resistance that regulates the charging voltage and amperage. Only a change of connections would be reasonably expected to reverse a machine. If you have the generator out of the chassis and have reversed the connections the machine might be driven in reverse, but in the chassis the condition you state appears improbable. The function of the mercury well is to regulate the voltage and amperage output of the generator by variable resistance, and its removal or failure has no influence on the direction of current, which alone could change the direction of armature rotation.

Motors or generators need not have all poles wound. When there are smaller poles between the main poles these are known as commutating poles, the function of which is to minimize sparking at the brushes. A two-pole machine may have both poles wound, or it may have the winding all on one main pole, in which case the unwound pole is known as the consequent pole and is of opposite polarity from the wound pole. By this is meant that if the wound pole is positive the unwound pole is negative, or vice versa. Generally speaking a machine with a single wound pole is a cheaper construction than two wound poles, though not necessarily less efficient. It is, obviously, extremely simplified.

The difference in machines, either motors or generators, constructed for high and slow speeds, is generally in the form of the armature. The high speed motor or generator armature is longer and smaller in diameter, so there will not be so great strain upon the armature from the centrifugal force, which might be enough to burst the binding bands and rupture the insulation and throw off the coils. The proportions of the machine are generally based upon the work that it is designed to do.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

CHANGING GEARS SLOWLY.

(J. D. B., East Orange, N. J.)

I own a four-cylinder 17 series Studebaker car and cannot change from low to second without grinding gears. Can you tell me how to change silently?

The general experience with this type of Studebaker car is that the best results can be obtained by reversing the practice found satisfactory with a very large number of other machines. That is, instead of the change being made quickly, which with the Studebaker construction will cause the gears clashing, the change should be made slowly, so that the gears will be approximately equal in speed before they are meshed. This will be found true with all changes of gear ratio from low to high. You can quickly learn just what can be done and the change will be perfectly silent if you take time for the operation.

THE MOTOR IN COLD WEATHER.

(P. C. C., New York, N. Y.)

Will you please advise me as early as possible how to obtain the best results from my motor car in cold weather? This information should interest your other readers also.

If the engine is functioning normally and in good mechanical condition, a lighter grade of oil is desirable, the cooling system should be filled with a solution that will not freeze in extreme temperatures and the carburetor should be adjusted, as gasoline will not volatilize as readily.

The lighter oil will have better fluidity when cold and will afford better lubrication when starting, until the engine has heated, and, if the equipment includes a starter, there will be less drain upon the battery while starting.

The cooling system should be drained and flushed if possible and filled with a solution. Water and glycerine in proportions of four quarts of water and three quarters of glycer-

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Charles River,
Mass.

ine will congeal at about eight degrees below zero; water and ethyl or grain alcohol in the same proportions will congeal at about 14 degrees below zero; water and methyl or wood alcohol in proportions of two quarts of water to one quart of alcohol will congeal at about 18 degrees below zero; water 85 per cent. and wood alcohol and glycerine (equal parts of each in mixture) 15 per cent. will congeal at about 20 degrees above zero; water 75 per cent. and wood alcohol and glycerine 25 per cent. will congeal at eight degrees above zero; water 70 per cent. and wood alcohol and glycerine 30 per cent. will congeal at about five degrees below zero; water 60 per cent. and wood alcohol and glycerine 40 per cent. will congeal at about 23 degrees below zero; calcium chloride and water two pounds to the gallon, will congeal at about 18 degrees above zero; calcium chloride and water, three pounds to the gallon, will congeal at about two degrees above zero; calcium chloride and water, four pounds to the gallon, will congeal at about 17 degrees below zero; calcium chloride and water, five pounds to the gallon, will congeal at about 39 degrees below zero. Calcium chloride, unless chemically pure, may attack the metal of the cooling system, but commercially pure calcium chloride, that contains acid, may be neutralized by the addition of ammonia or slacked lime. The calcium chloride solution may be tested with blue litmus paper and the ammonia or lime added to it until the blue litmus paper will not be changed to red when wetted with it.

The carburetor adjustment must be made to supply a mixture that will burn readily which can only be done by experiment, both idle and on the road, that will afford the best result. More gasoline will be burned than in warm weather. A hot air or water jacket for the carburetor will probably improve the carburetion.

Incidentally, the battery capacity will lessen and increase with fall and rise of temperature, which will undoubtedly have more or less bearing on engine starting. The battery should be kept as nearly charged as is possible, and in the event that it shows much reduced capacity should be charged outside the vehicle; such charging is advisable from time to time to maintain battery efficiency.

EMERGENCY BRAKE BANDS.

(F. E. D., Fall River, Mass.)

The other day when riding I had occasion to use the emergency brake in stopping. When I wanted to start again I could not release this brake. By having my companion work the lever back and forth while I shook and struck the rear wheels, it finally was released and has not bothered since. What would you suggest as being the matter?

It would seem that your trouble is due to the shoes of the internal expanding brake being worn, so that when the cam which expands the brake is operated it turns sufficiently to become horizontal in position. This makes it impossible for the springs connected to the brake shoes to release the brake from against the inside of the brake drum. It is best to fix this at once; you may not always be able to release them in the manner you describe, and the trouble grows worse with neglect. You should either have new brake shoes fitted or have pieces added that will reduce the clearance between the shoes and the cam.

WHISTLING OF EXHAUST GASES.

(G. H. D., Columbus, Ind.)

Recently I have been bothered by the exhaust gases making a whistling sound as they leave the muffler. If the cut-out is opened the noise ceases. What is the cause of this trouble and how can it be remedied?

The fact that the whistling sound ceases when the exhaust gases are expelled through the cut-out is evidence that the trouble is to be found in the muffler. No doubt some of its passages have become obstructed. The remedy is to clean the muffler. It is a good plan to disassemble at least once a year the silencer and thoroughly clean all the chambers. If, however, you do not wish to do this, the foreign matter frequently can be loosened by gently tapping the muffler walls with a wooden mallet. The exhaust gases from the engine will force the loosened matter out.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUG. 24, 1912, OF

THE AUTOMOBILE JOURNAL.

PUBLISHED SEMI-MONTHLY AT PAWTUCKET, R. I.
For Oct 1, 1916.

State of Rhode Island, County of Providence.

Before me, a Notary Public, in and for the state and county aforesaid, personally appeared William H. Black, who, having been duly sworn according to law, deposes and says that he is one of the owners of The Automobile Journal, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of Aug. 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are:

PUBLISHER, W. H. & D. O. Black, Jr. . . . Pawtucket, R. I.
EDITOR, W. W. Scott. . . . Pawtucket, R. I.
MANAGING EDITOR, W. R. Bickford. . . Pawtucket, R. I.
BUSINESS MANAGER, W. H. Black. . . Pawtucket, R. I.

2. That the owners are:

W. H. BLACK. . . . Pawtucket, R. I.
D. O. BLACK, JR. . . . Pawtucket, R. I.

3. That the known bondholders, mortgagees and other security holders owning or holding one per cent. or more of total amount of bonds, mortgages or other securities are:

M. J. BLACK, Mortgagee. . . . Pawtucket, R. I.

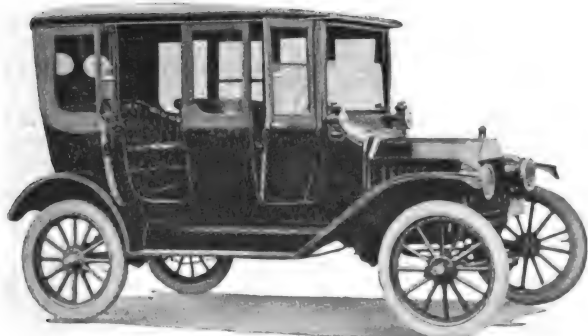
4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

(Signed) WILLIAM H. BLACK, Co-Partner.

Sworn to and subscribed before me this 13th day of Oct., 1916.

(Signed) THOMAS BESWICK, Notary Public.
(Seal) (My commission expires June 30, 1917.)

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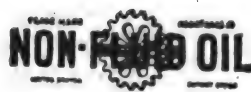
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DIFFERENTIAL GEARS ARE NOISY.

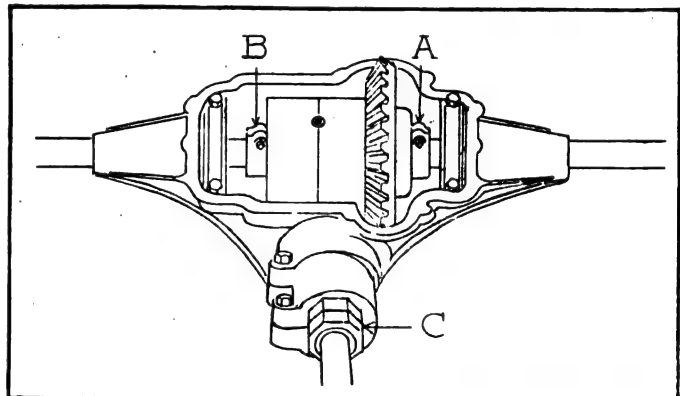
(P. W. W., Staunton, Va.)

What is wrong with the differential of my car? It is noisy in operation and the housing becomes too warm for me to put my hand on it. I have not attempted to do anything to it, and would like your advice before proceeding to fix it.

There are several causes for noisy differentials, but there can be only two good reasons why the housing should become unbearably hot. In the last mentioned case it is apparent that either the bearings fit too tightly or there is urgent need of lubricant. Although all differentials are not constructed alike, the principle of operation is generally the same, and, therefore, you can find assistance in the sketch published on this page. Assuming that the heat is due to the gears being meshed too deeply, which is more than likely the case, then you should make adjustments as suggested in the following:

When the master gear is too deeply in mesh with the driving pinion, the bolts on each adjusting collar should be loosened and the adjusting collar, indicated by A in the sketch, should be turned to the right, thus forcing the whole housing, with the master differential gear attached, further away from the driving pinion. After the proper adjustment has been made the collar indicated by B in the sketch should be securely tightened and collar A turned to the left until it is tight against the gear, after which it should be turned back to the right until there is a play of about .005 of an inch. This back lash is absolutely necessary; without it friction would develop between the collars and the roller bearings and produce heat.

Sometimes it will be found that the driving pinion gear is



Cut Away View of a Typical Differential Type, Showing Means of Adjustment.

not meshing with the master differential throughout its entire surface, and this must be compensated for by the pinion gear adjusting collar. Generally this collar is controlled by two nuts, located at the point of the housing, marked C in sketch, where the drive shaft enters. One of these nuts acts as a lock, while the second is the real adjusting member.

If after these adjustments have been made the assembly is still noisy, it is probably due to the gears being badly worn, in which case the only practical remedy is to have them renewed.

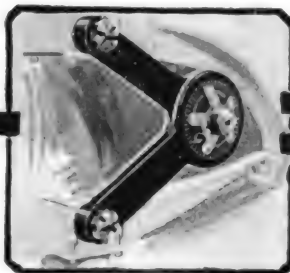
REMOVING CARBON WITH OXYGEN.

(H. M. Y., Harrisburg, Penn.)

Will you kindly advise how oxygen is used for cleaning carbon from cylinders?

It requires special equipment to remove carbon from the engine by the oxygen method. The oxygen is stored in a large cylinder to which is attached a hose connection and a metal nozzle. The spark plugs are removed from the engine cylinders and the nozzle inserted through the opening. The oxygen coming in contact with the carbon forms a mixture which is ignited by inserting a lighted taper or match into the cylinder. The carbon and oxygen combine and burn, forming a gas which passes off and leaves the cylinder clean.

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Using them on my Cadillac. Before, had trouble with breaking springs. Now, no trouble whatever.
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A remarkable transformation occurs in the riding qualities of an automobile after the

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They have made a marked improvement in the riding of my Hudson car.
E. M. Loomis.

From Chicago, Ill.

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J. B. Victor.

has been added. Comfort is realized, with accompanying economy. We have received thousands of letters attesting this.

Roads, before approached in fear and trembling, are traversed without the slightest mental perturbation and with absolute physical comfort, with less wear and tear to car and tires, and without spring breakage.

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On both my Buick and Hudson cars and giving real satisfaction and comfort.
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are unequalled for motor lubrication, freer from carbon, economical because they protect the motor against mechanical wear, and the quantity required is comparatively small.

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NEW YORK CITY CHICAGO
Woolworth Bldg. 1132 W. 37th St.

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1917

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— OF —

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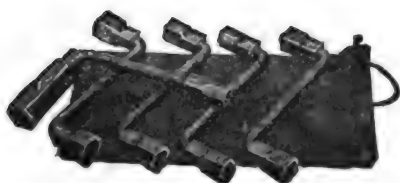
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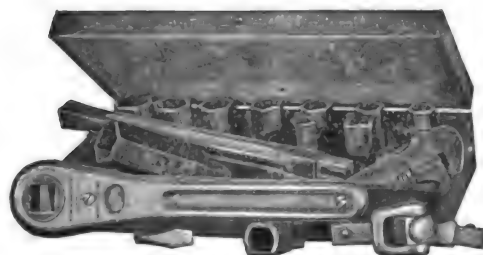
And Special Tools for FORDS



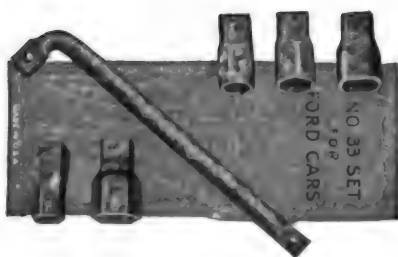
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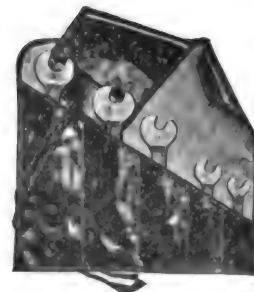
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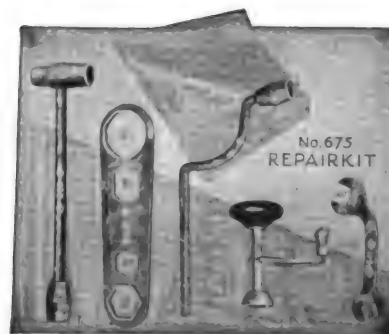
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The extraordinary focusing device.

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RAILWAY interests have again sought to place the burden of action upon motorists in the endeavor to minimize the possibility of accidents at railroad crossings at grade. No one objects to the elimination of the factors that make such accidents possible, and surely motorists in general can be depended upon to do their share toward achieving the desired result. But they cannot be expected to give up some of their patent right to the use of the public highways, as seemed to be the desire of railway representatives at a recent conference in Washington.

AT THE Aforementioned conference the railway representatives suggested two propositions, both of which are obnoxious to motorists. The first proposal was that motor vehicles should not be operated at more than 10 miles an hour within a 100 foot zone either side of a grade railroad crossing. The second suggestion was that the car should be brought to a full stop not less than 10 feet from the nearest rail of the crossing. The representatives of the A. A. A. did well in opposing both propositions, pointing out in the first case that such regulation would tend to create speed traps.

THE Full Stop proposal was rightly opposed on the grounds that it was unreasonable and did not subserve the best interests of motorists. If the regulation were applied to all crossings it would soon become a nuisance and a burden, as in the instance of those crossings where there is an unobstructed view of the rails in either direction for a considerable distance. A compromise proposition was that motorists come to a full stop at such crossings as public service commissions, or railway commissions, should designate.

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AUTOMOBILE JOURNAL PUB. CO.,
Times Building, Pawtucket, R. I.

AS LONG As We must have grade crossings it would seem to a motorist that the railway interests should share the burden of guarding such crossings. This end could be achieved very effectively by installing a sort of semaphore, or block, system in which warning signals at grade crossings would be set automatically as a train approached so as to indicate that there was danger ahead. It is the system on which a great many railway trains are operated and could be well adapted for the benefit of motorists. Another effective preventative would be to run the highways either over or under railways tracks. Still another means of minimizing the possibility of accidents would be clear crossing approaches so that the car driver could see the rails for at least 100 yards in either direction.

THE Feature Article of this issue deals with motor cars and motor routes in South American countries, and is made up of the conclusions arrived at by a trained observer and one who has all the facilities of an important branch of the United States and South American governments at his command. Consequently, it can be accepted as an authoritative statement of conditions in the Southern Continent, as relates to motor cars.

MORE Than 400,000 motor car enthusiasts, both owners and those who wished they were, are expected to visit the New York automobile show this year. This number is far in excess of the total paid admissions of last year, and is representative of the huge increase in motoring in all its phases. This exhibition, as well as the ones that follow at Chicago and Boston, is one of the most important ever held. The displays will all be covered very thoroughly in the special show numbers of this magazine.

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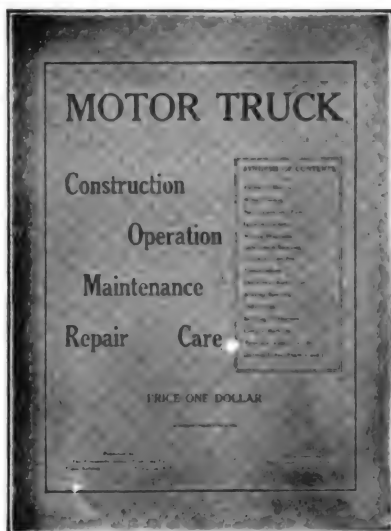
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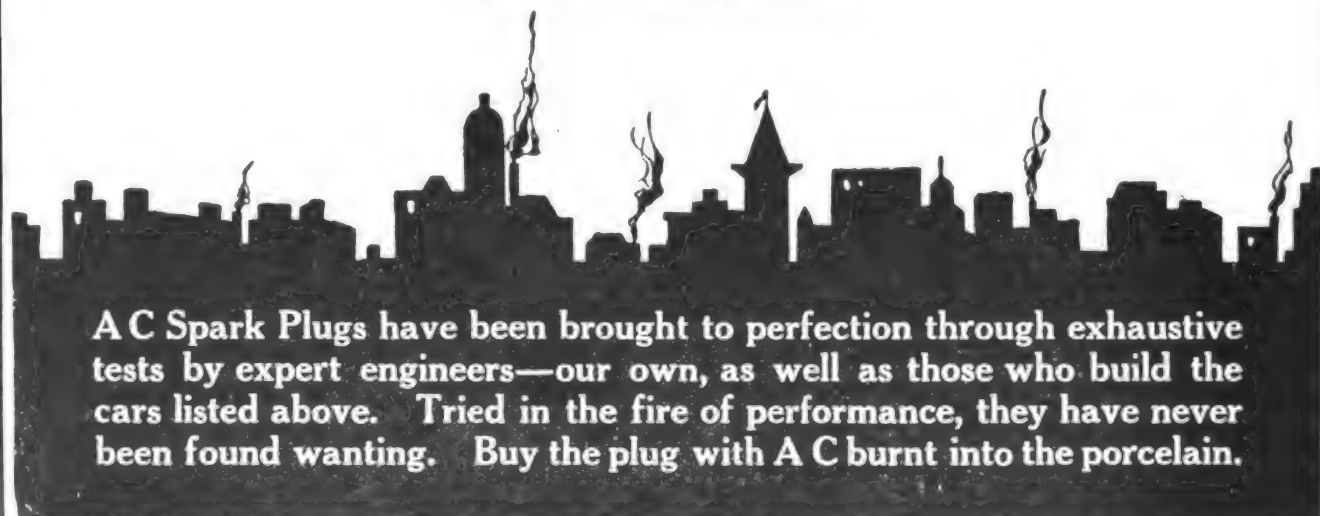
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THE Automobile Journal

VOL. XLII.

NOVEMBER 25, 1916.

NO. 8.



Crescent Shaped Water Front of Rio de Janeiro, Brazil, One of World's Most Beautiful Capitals.

Motor Cars and Highways in South America.

By William A. Reid

Member of the Pan American Union Staff.

THE western man who proposed to ride around the coast line of South America on a motorcycle was evidently not a very practical individual; he endeavored to locate gasoline stations along a route stretching for thousands of miles, where only primitive trails exist. The other and equally important factor had been overlooked—the question of highways over which he would travel. Possibly he assumed that some kind of road could be found and the spirit of adventure was urging him to attempt this unique journey, to return to his homeland a travel-stained hero ready for the vaudeville stage.

To the practical mind such questionable exploits rarely appeal; but the thoughts of dreamers sometimes set the masses to thinking and thereby prove a real benefit to humanity.

If we cannot yet motor around the edge of the great southern continent for lack of highways, we may enjoy delightful rides through cities and their suburbs, guide our cars over cattle-bedded pampas to snow clad mountains and into the valleys of growing crops. We may note with interest how the automobile is changing the lives of the

South Americans, as it is those of other lands, by drawing the tired man of affairs and his family to the life-giving air of the country; we may see the motor



Palm Avenue, Rio de Janeiro, Brazil.

truck displacing the time honored car with its enormous wooden wheels and array of oxen or mules. In numerous sections we may see slow and picturesque methods of work giving place to the modern and practical.

Motor cars and highways are so intimately related that, in considering the progress of one we must to some extent inquire into the condition of the other. There is no doubt that the increase of the former all over South America is a most potent force in the cause of highway extension. The joy rider, as well as the heavy truck owner, sees the need of better roads, and in many cases they are willing to vote in favor of local or national taxation in order to raise funds for road improvements and extensions.

Motor transportation for freight and passengers is making its appearance in some of the remotest regions of South America. In the barren nitrate section of Chile where the cart and mule have long done faithful service, one finds today a few automobiles. During recent travels through the nitrate fields several machines were placed at the writer's disposal, and they did excellent service



Geological Formation Near Corocoro, Bolivia, a Rich Copper District.

element enters into the operation of motor driven vehicles all over South America. The question of gasoline, as in this country, is serious and no doubt is retarding the sale of many machines.

Some months ago, while the writer was in Paraguay, the first motor truck ever seen in that country arrived in Asuncion. A considerable number of pleasure cars, especially those of cheaper grades, are in use in the Paraguayan capital; but the arrival of the monster truck created a new interest and hundreds of citizens watched the American agent demonstrate the possibilities of his machine. Even the President of the Republic and several members of his cabinet were willing to undergo the ordeal of riding over one of the roughest sections of highway that could be selected for the trials. The truck really proved a "wonder worker" and people and newspapers made favorable comments. Its advent in Asuncion revived a movement

over some of the most trying trails—not to mention roads—to be encountered in any country. Furthermore, it was learned that eight motor trucks were to be given a trial in the handling of nitrate.

The two-mule team and cart used exclusively at present cost about \$700. Small locomotives, worth several thousand dollars, may eventually be replaced, provided the motor truck proves its practical utility. The truck costing \$2000 or \$3000 may be more economical than the old system; the clearing and making of a cheap road for the truck will doubtless be less expensive than the laying of railway tracks for the locomotives and dump cars. At any rate, the experiment is well worth watching by those interested in the sale of commercial cars; for should the 140 or more companies operating in Chilean nitrate eventually adopt the auto truck the demand will gradually grow to thousands of machines.

The power to operate the motor truck in Chile must be a low-grade oil rather than the expensive gasoline. This same



Avenida Espana, a Beautiful and Typical Street in Asuncion, Paraguay.

previously started to place several motor trucks in service between interior districts and the larger towns, where the only means of transportation today consists of carts and pack animals.

Paraguay has few modern roads, but the country is undulating and naturally suited to motor vehicle operation. The construction of highways will doubtless assume at least an impetus after the introduction of a greater number of automobiles. This country admits the automobile free of duty.

Bolivia, one of the world's most diversified countries topographically, has been for several years using the commercial automobile to great advantage. Railways were not being built with the activity that the country's trade demanded, and trucks were introduced on a regular run from Potosi to Sucre (150 miles), where highways are far from good. This was an experiment in freight and passenger service; and the cars long ago demonstrated their practicability.



The Municipal Theatre of Rio de Janeiro, Where World's Great Artists Appear.

Since the advent of the truck in Bolivia the roads have received more attention than formerly; the pleasure car has become a necessity and their number has increased, especially in La Paz. On a recent occasion a Bolivian drove his car from La Paz to Sarata, 80 miles, over roads that were considered impossible for the motor driven vehicle. This feat received wide newspaper publicity, and in reality showed the citizens that even the roughest roads do not entirely prevent the use of the automobile.

In Bolivia every citizen must give at least two days' labor a year upon the public highways. The distance between Bolivian cities over which stage coaches are now operating aggregates more than 700 miles; and those places off the railways, like Sucre, Tupiza, Tarija, etc., may demand greater transportation facilities now that the revival of the mining industry has reached such an active state and railways cannot be constructed



Rio de Janeiro Looks More Like a European Capital Than American.



Looking Down the El Prado in Montevideo, Uruguay.

quickly enough. The motor car supplies the missing link.

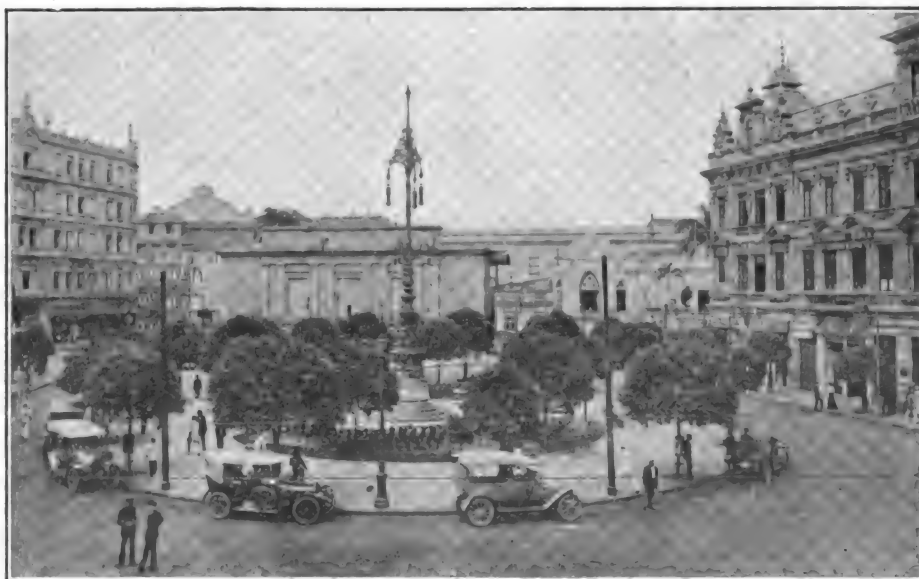
Peru, has granted a concession for a highway 125 miles long, starting from a point on the Juliaca-Cuzco railway to the Madeira river or one of its branches. This will not be a route for automobiles, but the concessionaire must construct a road at least eight feet wide and keep it in good condition for 30 years. The government grants about half a million acres of contiguous land to the builder; as it is likely that these lands will gradually be exploited, the presumption follows that eventually the horse car must be displaced by the modern method of transportation. The concession is merely mentioned here to indicate one of the remote possibilities for automobiles; if they can be operated in the Bolivian Andes, as they are today, they may also find their way to the eastern Peruvian Andes.

Peru is not a land with many miles of automobile road. There are, however,

in the capital city, 300 or more machines, many of which are used as taxicabs.

In Colombia the department of public works has made plans, backed by large government appropriations, for constructing highways suitable for automobiles. Only a few of these can be here mentioned: Fifteen thousand for a road from Popayan to Pasto; \$8000 for one from Pamplona to Casanare; \$24,000 yearly for highway improvements from Bogota to Boyaca; \$10,000 for a road from Santa Marta into the coffee district of that section; and a subvention of \$30,000 for an automobile road to the medicinal springs about 30 miles from Barranquilla.

Notwithstanding the high price of gasoline, which at present is worth 50 cents a gallon in Caracas, Venezuela is buying cars and improving roads. During the fiscal year of 1915 three commercial trucks and 227 pleasure cars were shipped there from this country. In the first six months of 1915 Venezuela spent \$86,000 in motor vehicles, and with one exception every car came from the United States.



A Taxicab Stand in Rio de Janeiro—Motor Cars Run Very Fast in This City.

A few months ago automobile service was established between the towns of Tumere-mo and Ciudad Bolivar, the distance being 245 miles. At present it requires about 32 hours to cover the distance; the slowness being caused by the rough and winding roads. This time, however, is much faster than the stage coach and horses, and as the highway is cleared of stone and otherwise improved the service will doubtless be much more rapid. Ciudad Bolivar is a thriving port 600 miles up the Oronoco river; it has 20,000 people and there are about 40 automobiles as a nucleus for a larger number.

The greatest natural area of South America, where many dirt roads provide fairly satisfactory commercial arteries, is found in Argentina, Brazil and Uruguay; and in each of these countries highways are gradually extending and motor vehicles are multiplying.

In 1915 two American automobile agents in Argentina engaged in a race. One drove a heavy truck and the other used a small runabout—a David and Goliath so far as size and strength might be compared. It was a peculiar race; the little car moved from starting point with rapid speed, but ere long the rough course selected by the committee began to stun and stagger the light machine. Then along came the giant; one pushed ahead, then the other; and those following the racers became more interested and betting grew active. The Buenos Aires papers devoted considerable space to the event, which finally ended in a draw. The keynote of the race, however, was automobile advertising, and in this respect it scored success.

The Argentine Touring Club, one of the leading organizations of its kind in South America, proposes to hold an au-



Mountain Highway in the Far Southern Chilean Andes, Over Which a Few Automobiles Have Passed.

tomobile show this year in connection with other functions commemorating the country's centennial. American manufacturers of cars were expected to be well represented, and doubtless the enterprise would give a still further impetus to motoring in its various phases.

In the different sections of Argentina one sees the motor 'bus or truck in steady use. In the sugar districts of Tucuman, in the far south from Bariloche to Lake Nahuel Huapi, and in the central pampa region, the auto is engaged in both freight and passenger service. Although modern macadamized roads are few, the auto truck of 40 to 50 horsepower is commending itself as a burden bearer of wonderful possibil-

ities. A rather peculiar use of the machine I observed in north Argentina; a five-ton truck was following the flight of locusts, with chemicals and fighters, the latter endeavoring to exterminate at least a few of the millions of these crop destroying pests. This truck was a fine \$6000 machine and was operated by agents of the Federal Department of Agriculture.

In 1912 Argentina imported 4281 automobiles from various countries; in 1913, 5115; in 1914, 2185; during the first six months of 1915 that country received 629 machines from the United States. The figures indicate a gradual increase of motor vehicles, the smaller number of importations for the last two years being attributed to adverse business conditions following the outbreak of the European war.

Uruguay has more than 5000 miles of national and state highways, and, compared to the size of the country, probably more good roads than any other South American Republic. Only a small percentage are macadamized. The government proposed to spend a sum not in excess of \$300,000 for highway construction this year, the appropriations coming from the country's general revenues. The contract was let to provide Mercedes, Paysandu, Salto, etc., with modern sewerage and water systems, and the paving of streets and suburban drives in these and other places foreshadows automobile activities. The fact that only 45 cars entered Uruguay during the first six months of 1915, compared with the increasing number in use in the country, shows that the store rooms are being depleted and the machines placed in service. Upon inquiry in Montevideo I found that about \$68 paid the duty and freight on a light car coming into Uruguay from

(Continued on Page 36.)



In Chile—On the Road from Valparaiso to Vina del Mar, a Popular Seaside Resort This Scene Showing How the Road Borders the Ocean.



FEW motorists realize that while their cars are running along enough surplus heat is being generated and exhausted from the engine to maintain a comfortable temperature in the average sized home. This steady flow of heat that is constantly passing out through the exhaust can be cheaply and quickly turned to the purpose of heating the interior of the car and making the operator and occupants as comfortable on the coldest day as they would be riding in a railroad coach. While the many devices that are on the market to utilize this heat in winter serve the best on cars with enclosed bodies, they are also serviceable on open type bodies and with the use of robes will keep the passengers comfortably warm.

Car heaters have been simplified to the point where they are not only one of the cheapest of auto accessories for winter service, but can be installed without much, if any, expense and can be taken off again in the spring without disfiguring or depreciating the car's value in any way.

Exhaust Gases Generally Used.

There are a number of different types, but the majority are operated by the exhaust gases from the engine taken through a flexible steel tube and the heat is radiated into the car through radiators which come in various forms and sizes. Other kinds operate on a principle similar to a hot water heating system in a home, having a radiator connected up with the water circulation system on the motor, while another type employs a direct flow of air driven by the fan and superheated by passing over the hot sections of the manifold and exhaust pipes. There are also electrically operated heaters which derive their heat from a current of electricity from either the batteries or generating outfit on the car.

The self contained heaters, similar to those used in sleigh riding times, have also come into common use by motorists. These generate their own heat through the combustion of special carbon heating bricks which are lighted and



Utility Protected Heater.

burn slowly in a compartment within the heater shell.

Regardless of the kind of warming device to be selected, the motorists who endure the cold without the use of some type of heater cannot appreciate their value. The first cost is the only cost with most of the devices and they are all practically under normal weather conditions in winter, giving a constant flow of heat and having regulation methods by which the degree of heat in the car can be controlled.

The drivers' welfare may also be taken care of in the open car by the use of the special wheel warming devices which are operated from the batteries or generator on a very slight amount of

current. Wheel warmers will keep the driving wheel at a comfortable temperature no matter what the temperature of the air may be and the operator is made as comfortable as the other occupants of the car.

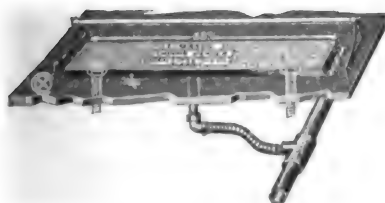
Konsrv Electric Heaters.

Several different types of heating devices are made by the Konsrv Electric Company, of Cleveland, O., including three different models of heaters for enclosed cars, wheel heating apparatus and two types of radiator and engine heaters for use when cars are standing in the garage or other place where there is danger of freezing.

The heaters for use in automobiles are operated by electricity and are in the form of a substitute for foot rails. No. 14, which sells for \$5, is oblong in shape, 14 inches long. No. 22, which sells for the same amount is round and 22 inches in length. The large size No. 34 sells for \$6.50. They are finished in polished nickel and made for the following voltages: Six, 12, 18, 24, 30, 60 and 80. After the current has been turned on for a few minutes and off again the heaters will remain warm for over 20 minutes. While they give out a steady, strong heat, they cannot burn anything that should come in contact with them.

The other well known Konsrv product is the steering wheel electric heater, which is applied to the rim of the wheel and keeps the entire surface warm in the coldest weather. It is connected to a switch attached to the underside of the steering post, thence to the leads from the generator to the battery. The current consumption is only four amperes, six volts. The price is \$5.

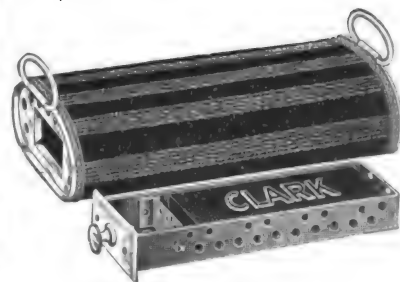
The Utility heaters, made by the Hill Pump Valve Company of Chicago, Ill., are made in two styles, the protected heater, which is adapted to all makes of cars, and the Junior for Fords. The former sells for \$15 and the Junior model at \$7.50.



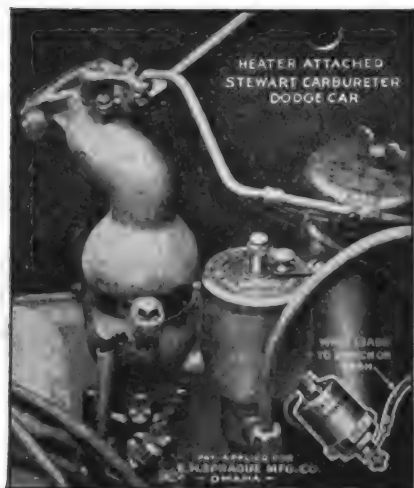
Mason Thermo Heater.



K-P Foot Rest Heater.



Clark Carbon Heater.



Thorwald's Electric Carburetor Heater.

These heaters, which have proven themselves highly efficient, are well known. The large size is 28½ inches long and is fitted with five feet of interlocked flexible tubing and exhaust fittings to fit any make of car. The smaller heater is 19½ inches long, and comes with three feet of flexible tubing and is also furnished with an exhaust fitting that will fit any make of car.

Similar in shape and serving the purpose of a foot rail, both heaters are fixed to the floor in any position desired. Connection with the exhaust pipe is made by drilling a one-inch hole just ahead of the muffler. The exhaust fitting clamps over the hole. A control valve at the inlet side of the heater enables the occupant of the car to turn the flow of heat off or on.

Mason Thermo Heater.

A heater for enclosed cars, designed on the same principles as are employed in radiator heating practises in the home, is manufactured by the Cox Brass Manufacturing Company of Albany, N. Y., and is known as the Mason Thermo Heater. It is 28 inches long, four inches wide and ¾ of an inch thick. It sets ¼ inch above the flooring, giving room for circulation and radiation of heat underneath. Two kinds are marketed, an all bronze, heavily nickel plated heater, which sells for \$15 and a cast iron finished in black enamel selling for \$10.

The operating principles are the same in both types. They are connected with the exhaust pipe by a one-inch flexible steel tube which enters the heater at the centre, allowing the hot air to pass to either end, giving uniform heat. The operation of the heater does not result in any back pressure on the engine and there is no danger of overheating, as an automatic thermostat regulator controls the temperature to any desired degree. This is an excellent feature, as it obviates the necessity of constantly attending the heater in case the car is to be left running.

Clark heaters are self contained and generate their own heat by the slow combustion of carbon bricks which are made specially for the purpose by the manufacturer, the Chicago Flexible Shaft Company, La Salle and Ontario streets,

Chicago. The heaters are built in the form of an oval or triangular steel case and covered with some kind of carpet of different colors. A steel drawer fits in the end and carries the carbon fuel brick. This brick is heated in a fire before being placed in the drawer, and after being once ignited continues to burn slowly until entirely consumed, leaving only a white ash. It is odorless and throws off a strong continuous heat for 12 to 16 hours. The heaters can be moved to any position when it is desired to concentrate the heat. They are fitted with adjustable ventilators in the ends or sides or at both places by which the volume of heat may be regulated.

19 Clark Models of Heaters.

They are made in 19 different models, varying in price from \$1.50 to \$10, according to size, quality of covering and finish. The Clark carbon fuel bricks are sold in dozen lots at 75 cents a dozen or by the 100 in wooden cases for \$6. A second grade of bricks sell for 60 cents a dozen and \$4.80 the hundred. Bricks can also be purchased in third and half dozen lots if desired.

The Bridgeford car heater for Ford cars can be used either to keep the occupants' limbs warm in open cars or will



Radio Auto Heater.

heat the entire interior of an enclosed Ford car to a comfortable temperature as long as the engine is running. It is bevel shaped to make an easy rest for the feet and can be put in front without interfering with the driving pedals or lever controls. It is made of steel with an asbestos bottom. The connection with the exhaust pipe is made by a specially constructed clamp which makes it easier to attach than a muffler cut out, and when the heater is removed this clamp can be given a quarter turn and the hole in the exhaust pipe is closed tightly. The heater, which is manufactured by the Home Light Company of 3353 Milwaukee avenue, Chicago, sells for \$3.50 complete.

The Brickey patent heater for Ford cars will give a steady flow of warm, pure air from the fan as long as the engine is operating. The heater for use in the driving compartment is composed of a sheet metal jacket with a funnel opening and is slipped over the exhaust manifold, taking the air from the fan which is forced through a tube and a foot plate register into

the front end of the car. This heater sells for \$3.90. The rear heater, which sells for \$4.90, is of sheet metal covered with an asbestos jacket, 24 or 30 inches long, and slides over the exhaust pipe under the car. The air is forced into it from the fan through a flexible pipe and after it has become heated the air passes into a tubular register along the back end of the front seat. The heaters are manufactured by the Thurston Auto Supply Manufacturing Company, 3020 Michigan avenue, Chicago, Ill.

Dunco Heater Ventilator.

The Dunco heater, manufactured by the Dunkirk Corporation of Dunkirk, N. Y., is designed not only to give off a flow of warm air to the interior of any kind of an automobile, but incidentally acts as a practical ventilator which keeps a steady flow of fresh air passing into the enclosure occupied by the passengers. It does not continually reheat and radiate back the same air over and over. When the car is standing still with the engine idling there is only a gentle flow of warm air through the radiator, but when in motion the fresh air is forced through the radiator in any quantity desired by the occupant who can regulate it by a touch of the foot or finger. The extra heat required to heat the increased flow of air is furnished by the greater labor of the engine.

The heater, which is of steel, is an oblong chamber 12½x8½x3 inches, and can be placed either flush with the floor boards or on the seat panel. Neither the air or register is hot enough to injure the car or the most delicate fabrics. The price is \$20 f. o. b. Dunkirk, complete with all connections.

J. M. Foot Rest Heater.

The J. M. foot rest heater is distinctly different from the other heaters on the market, employing a different application of the exhaust gases of the engine. The

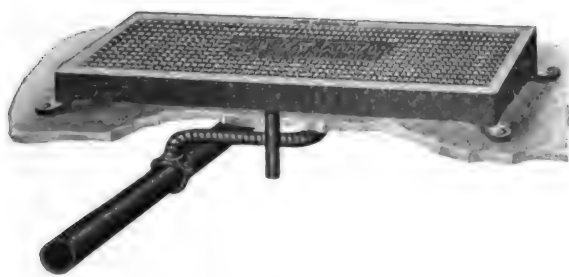


Auto Rad Heater Showing Connections.

heater proper is cylindrical in shape, with rounded ends, and forms a receptacle for water. A pipe, considerably smaller in diameter, enters at the bottom of one end and through the centre and out at the bottom of the other end. The exhaust gases pass through this smaller pipe, heating the water to a boiling temperature. This system of radiating the heat into the car from the exhaust not only makes the heater give off an even heat throughout its entire radiating surface, but it continues to radiate the heat that is stored up in the water for a long time after the engine has been shut off. This heater, which is sold with complete attachments for \$15, is manufactured by the J. M. Shock Absorber Company of 250 West 54th street, New York City.

F. H. Heat Radiator.

The F-H heat radiator, marketed by the Foss-Hughes Company, Market and Twenty-first streets, Philadelphia, is similar in type to the hot air registers used in house heating systems. It can be installed in the front compartment or further back where the pan under the engine extends back under the floor boards and admits the hot air that is radiated from the engine. These heaters are made in either brass or nickel at \$10.



M-S Auto Heat Radiator.

Lehman Bros., 10 Bond street, New York City, makes a big line of the self-generating type of heaters which derive their heat from a slow burning brick of combustible substance which burns in an interior compartment of the device. The case of the heaters is covered with fabric or metal and presents a highly finished appearance.

K. P. Foot Rest Heater.

The K. P. Foot Rest Heater Company, 250 West 54th street, New York City, manufactures several models of foot rest heaters which employ a portion of the exhaust gases to warm the car. The higher pressure gases are taken through a flexible steel tube from a hole tapped in the exhaust pipe and flow through tubes of constantly increasing diameter, the pressure being reduced as the gases cool. There are no openings in the heaters through which any of the gases may escape to the car or to collect dust. A regulating valve at one end controls the flow of heat.

Model "A" is made of all brass, highly finished in white nickel and is sold in any length up to 40 inches, with all equipment, for \$25. Model "B" is of a similar pattern, but has malleable iron brackets and steel foot rail. The rail is finished



Cutaway View Utility Heater.

in white nickel and the brackets in black enamel. This model sells for \$17.50. Model "C," which may be used either as a foot rest heater or as a heater only, sells for \$12.50.

Auto Rads for Ford Cars.

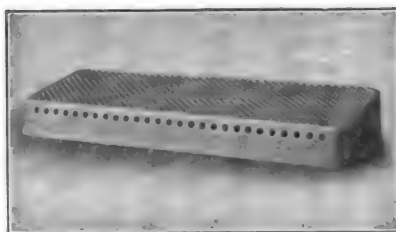
The Auto-Rad is a heater designed specially for Ford cars and is serviceable either with or without enclosed bodies. It is a specially designed radiator covered by a black enameled steel casing which harmonizes with the interior finish of the car. It receives its heat from

the exhaust gases of the engine and can be removed without marring the finish of the car. It is practical, however, to leave it in permanently, once that it is installed, as the whole system weighs only four pounds. It is manufactured by the Brevendo Manufacturing Company, Inc.,

Arlington building, Rochester, N. Y.

An exhaust heater of the register type is manufactured by the Milwaukee Auto Specialty Company, 705 Chestnut street, Milwaukee, Wis., which is installed in the floor of the car in either the front or rear compartments or in both and is connected with the exhaust pipe by the regulation one-inch iron pipe or flexible tubing. The heater, which is known as the Radio Auto Heater, is made of sheet steel, which is claimed to give from 10 to 25 per cent. more efficiency than cast iron for heat radiation purposes. The heaters sell at \$8 each, not including exhaust valve or connections. If ordered through a garage man the complete apparatus may be purchased, including installation charges, at from \$10 to \$12.

The Consolidated Car Heating Com-



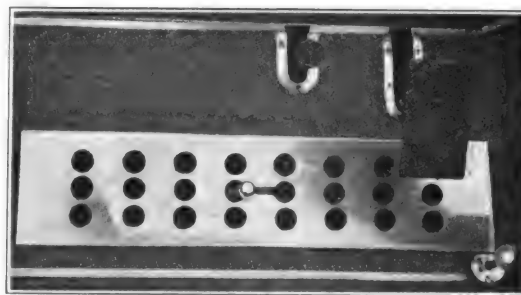
Consolidated Electric Heater.

pany, Singer tower, New York City, manufactures two types of electric heaters. The one used for heating the interior of automobiles is designed to operate on high voltage in the case of the electrically driven machine and on low voltage with the gasoline car. It is formed like a foot rest and has a thermostat which controls the temperature so that it is impossible for it to become overheated to a degree from which any injury would result.

The other heater sold by the company is attached to the motor of the car and when the machine is placed in the garage the device is connected up with the electric lighting system. It keeps the circulation system from freezing and makes the car easy to start on cold mornings. Only a small amount of current is consumed, the cost being around one cent an hour.

Electric Carburetor Heater.

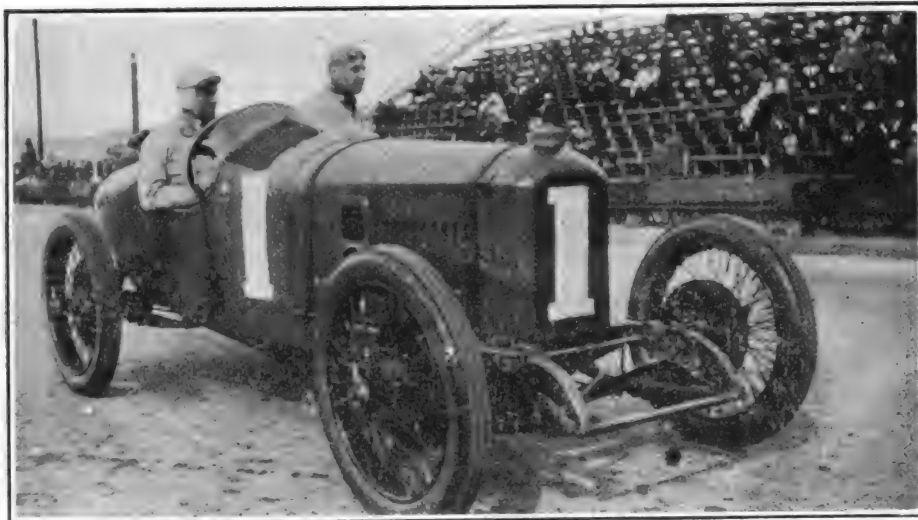
The E. H. Sprague Manufacturing Company, Omaha, Neb., manufactures a device for heating carburetors which enables the car owner to start his car as easily in cold weather as in warm weather. This apparatus or device is known as Thorwald's Electric Carburetor Heater. The gasoline enters an outer



Foss-Hughes Footboard Heater.

chamber and then goes into an inner chamber, where the heating coil is located. When the switch on the dash is turned on the gasoline in the heater chamber boils almost instantly and as it percolates through the carburetor, vaporizes. A big saving in battery strain is effected and in the case of a car that is not fitted with a self starter both time and manual labor are saved. The amount of current necessary to operate the device five minutes is about the same as what would be required to run the lights five minutes. Current must be drawn from a storage battery, as it will not operate on dry cells. A cable and switch are included in the equipment and also a book of instructions for installing. The price complete is \$5.

This presentation of heaters is representative of the large variety of types to be had. In the succeeding issue will appear an illustrated article descriptive of the representative types of devices on the market for heating garages efficiently, economically and safely. As in this article, names of manufacturers or distributors, their addresses and the prices at which each is offered, will be published for the convenience of the readers.



Resta in Winning Peugeot—Vanderbilt Cup Race.

RESTA IS SEASON'S CHAMPION.

DARIO RESTA pocketed a comfortable fortune at Santa Monica, Cal., on Nov. 16 when he won the Vanderbilt Cup race and also crowned himself king of the American speedways for 1916.

The fact that the Vanderbilt Cup ended the racing season in so far as it had any effect upon championship honors, was due to a peculiar train of circumstances involving the outcome of the Grand Prix races, which followed two days later, and the system used by the A. A. A. contest board in awarding championship honors.

Resta's victory in the Vanderbilt Cup gave him 1000 points additional and placed him 660 points ahead of Aitken for the championship honors. Aitken consequently based his hopes on the Grand Prix to overcome his opponent's lead and win the race, but he crossed the finish tape in Wilcox's Peugeot, which he had picked up after the latter had gone 20 laps, and asked to be relieved. Aitken's own car went out in the first lap. As a result of this change of drivers Wilcox was allowed 416 points of the 1000 points that was to be awarded to the winner and Aitken received none.

There is only one more big event to be run this year that will influence championship honors, the Ascot Speedway events on Thanksgiving Day, but as Aitken declared he would not compete in these, the championship field is left open to Dario Resta.

As a result of this situation Resta becomes the star racing driver of the season, although actual records show that he has won but five firsts so far this year against Aitken's seven; yet the former took \$2094 more in prize money.

To return to the fortune that Resta tucked into his pockets, referred to in the opening paragraph, he, in winning the Vanderbilt Cup, earned \$4000, the first prize in that event, cinched his claim on the \$14,000 odd that goes with the championship title put up by the Bosch Magneto Company and the Goodrich Tire Company and also the beautiful and

costly Bosch trophy which was put up by the magneto concern. His victory brought him about \$20,000, aside from the highest laurels in speedwaydom.

His performance in the race was fully equal to the rich awards, as he drove the Peugeot faster than any automobile had ever gone before over a race course on the roads, making the 294.3 miles at an average speed of 86.98. He set a new record and went 11 miles per hour faster than the time for the race over the same course last year.

Earl Cooper, driving a Stutz, finished second and William Weightman, a millionaire sportsman, who was a dark horse entry, drove his Duesenberg across the line in third position.

Aitken was setting a fast pace when he dropped out for good in the 20th lap with a broken intake valve.



The Remains of Jackson's Car—Grand Prix Race.

The Grand Prix.

In the Grand Prix race, held Nov. 18, Aitken, whose car went out in the first lap, took the wheel of Wilcox's Peugeot in the 20th lap and won the race at the rate of 84.59 miles per hour, a new record for the distance and track. However, the credit went to Wilcox.

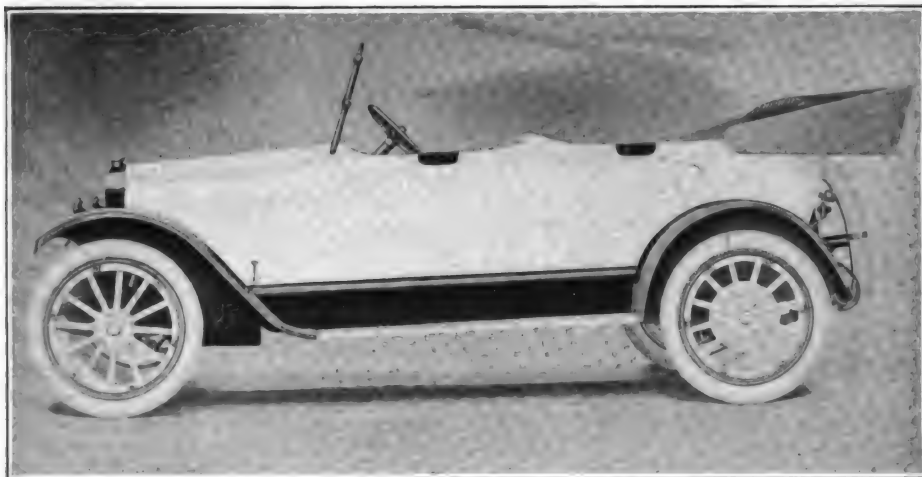
More serious excitement was caused during the contest by an accident which resulted in the death of three spectators of the race and Lewis Jackson, the race driver who was piloting a Marmon. On the 13th lap of the race he appeared to have lost control of his car when it swerved from the course into the crowd and smashed up against one of the palm trees along the highway. Jackson was instantly killed. A motion picture operator, a spectator and an unidentified woman were also killed when the car shot into the crowd.

Cooper finished second in 4:48:59, an average of 83.74 miles per hour, and Paterson, in a KisselKar, crossed the tape in third position in 5:09:38, an average of 78.13 miles per hour.

Eddie Pullen held the previous record that was broken by the drivers that came in in the first three positions, his average two years ago being 77.22 miles per hour.

The following table gives the standing of the race drivers for the championship honors under the A. A. A. point system:

Dario Resta....	4100	Dave Lewis....	500
John Aitken....	3440	Ira Vail.....	450
E. V. R'k'bacher	2210	P. Devigne....	350
R. De Palma....	1790	Clyde Roads...	280
W. D'Alene....	1120	Hughie Hughes.	275
Earl Cooper....	1045	Paterson	270
Thomas Milton.	690	W. W'tman, 3d.	240
Pete Henderson	667	Geo. Buzane....	210
F. Galvin.....	645	L. O'Donnell...	185
Ralph Mulford.	620	C. J. Devlin....	140
H. Wilcox.....	596	Arthur A. Klein.	125
J. Christiaens..	540	Jack L. Cain....	120



The Yale, Finished in Ivory White and Black.

THE use of standardized products is one of the chief features of the Yale Eight, produced by the Saginaw Motor Car Company, Saginaw, Mich. The maker lays much stress upon this fact, pointing out that the units entering into the car's construction are all well known as having stood the test for a number of years, and further declaring that an owner is always assured of the maximum of service in securing parts, if necessary, direct from the maker of each part.

Externally considered the Yale Eight is a striking job, it being finished as standard in ivory white with black fenders and trim or in Yale blue and black. As for lines the car gives the impression of speed and extreme riding comfort, and its French-American body design has caused it to be dubbed the "Parlor-Car." It has a tilted windshield, beautifully rolled body edges and built in double cowl dash, all of which creates the impression that the body is one piece.

Extreme Riding Comfort.

The upholstery is in genuine leather and is unusually deep and soft. Both front and rear seats have extra high backs, which conform to the curvature of the spine in the natural manner for riding comfort. The weight of the whole car is evenly balanced and distributed to secure comfort and safety on the road.

The Yale Eight is very well equipped. Rich, thick and durable rugs cover the floors of the compartments, and spacious leather pockets are provided in all doors and built into the rear cowl space back of the front seats. This space also accommodates the extra folding seats, which are entirely concealed when telescoped.

Only One Yale Model.

For the present the Yale Eight will be supplied in only one model, a seven-passenger touring car selling for \$1350, fully equipped. This car may be equipped with a winter top in the 1917 production.

The power plant has an eight-cylinder Saginaw engine cast in two blocks of four cylinders each and placed V shape at an angle of 90 degrees. Bore and stroke is $3\frac{1}{4}$ by $4\frac{1}{4}$, and the horsepower by S. A. E. rating is 31.25. The carburetor is a Rayfield special type and is carried in the V alley. Fuel is fed by vacuum from a 20-gallon tank at the rear of the car. Directly at the front of the V is the Remy ignition unit. The electric lighting and starting equipment is a six-volt system with a separate generator for lighting and a motor for starting. The battery used is a Willard.

In the lubrication system the oil is forced to all the main engine bearings, the overflow being passed on to the

Constructional Details of New Yale Eight.



Louis J. Lampke, Designer of the Yale Eight.

troughs in the crank case, whence it is splashed to the other working parts by the connecting rod dips. Cooling is by the thermo-siphon system, aided by an extra large radiator, fin and tube type, and a fan of ample size.

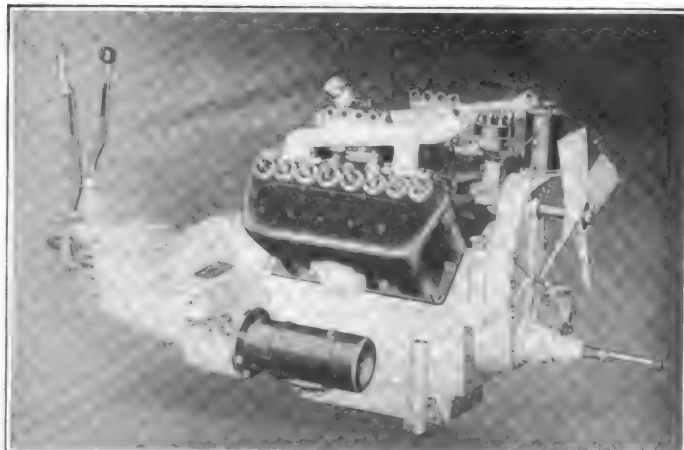
Timken Bearings and Axles.

In unit with the power plant and gear-set is a multiple disc clutch. Power is transmitted through a three-speed selective Muncie gearset. Hotchkiss drive, Timken axles, both front and rear, and Timken bearings are features of the chassis construction.

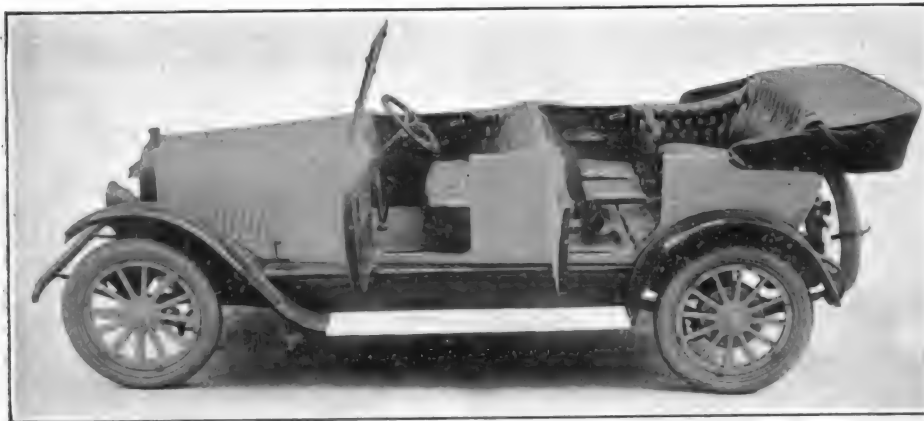
The rear springs are a special design, three-quarter elliptic, angle drop, while those at the front are semi-elliptics. There are two sets of brakes working



The Left Side of the Unit Power Plant.



The Horsepower of the Engine Is 31.25.



The Interior Is Designed for Comfort.

on large steel brake drums and of the internal expanding and external contracting type. On the gasoline tank at the rear there is a gasoline gauge located beside the filler, which is a decided convenience.

The frame is a pressed steel 4 7/16 inch channel, amply large to obtain the largest measure of strength in all service, which is a feature of Yale construction.

The wheels are heavy artillery type, 12 spokes front and rear, and carrying Firestone demountable rims and 34 by four-inch tires, non-skid on the rear. The wheelbase of the chassis is 126 inches.

The steering gear is Lavine make, with spark and throttle control on top of an 18-inch corrugated wheel in which is set an aluminum spider. In the centre of the wheel is the electric horn button. The steering column is held rigidly in position by a support running to the instrument board. On this board there is a cowl light, an ammeter and a speedometer. The electric lamps are Victors.

The Designer of the Car.

The designer of the car is Louis J. Lampke, general manager of the Saginaw company. He conceived the idea of the ultimate Yale about seven years ago, and has "lived with it" as the saying goes, ever since, putting the car to exhaustive tests during a period of three years. In his early days Mr. Lampke was connected with the Palmer-Singer makers, the Lyon Motor Car Company of Michigan and with the Mt. Pleasant Motor Company, as its designer and chief engineer.

IMP ADVERTISEMENT ATTRACTS ATTENTION.

Few advertising novelties have attracted as much attention in New York City as the motorcycle outfit that is operated by the Imp Carbon Chaser Corporation on the streets of that city.

The operator of the machine wears a Mephistophelian hood and mustache and on the panels of the body of the car attached to the motorcycle there are large devils' heads, in replica of the trade mark of the Imp carbon chaser. On the forward panels there is a facsimile picture of the containers in which the Imp Carbon chasers are packed. This novelty was conceived by W. S. Milliken,

president of the Imp corporation.

Imp carbon chaser is different essentially then all other carbon remedies on the market. It comes in small oblong cakes and one tablet is used with each five gallons of gasoline to secure the desired results. It not only eliminates the formation of carbon, but incidentally results in increased power, perfect ignition, uniform combustion and greater mileage to the gallon of gasoline. The engine will run on a much lighter mixture and other favorable results are obtained that naturally would follow the elimination of carbon troubles.

The carbon chaser was tested for 18 months before Mr. Milliken placed it on the market, and he also claims as a result of his tests that there is not the slightest chance of damage to the engine or any of its parts by the use of the chaser.

CHURCH GASOLINE FEED IN SEVERE TEST.

Tests were recently conducted on the Chicago speedway of the Church gasoline feed in operation on a Mercer and a Jeffery car under the supervision of F. E. Edwards of the A. A. A. technical committee.

Mercer Car Used in Test.

A Mercer roadster, model 22-70, equipped with the Church feed, was driven 10 miles in 27 minutes, 58 4/10 seconds, an average speed of 75.4 miles

an hour. The maximum speedometer reading during the run was 84 miles. The auxiliary gasoline tank that is part of the Church feed was full to the top at the end of the test, which proves according to the manufacturers that with proper carburetor adjustment the motor can be given all the gasoline it will take, which will insure maximum motor efficiency at all speeds.

The Church gasoline feed system has an auxiliary tank on the dash from which the gasoline is fed by gravity to the carburetor in a manner similar to other systems of this character. The principal feature, however, is a check valve mounted in place of the pet cock on the rear cylinder supplying the pressure for forcing the gasoline from the main tank to the auxiliary tank. The ordinary maximum pressure used is not over 1½ pounds, but in the test the pressure ran up to 3½ pounds, indicating the automatic increase in pressure to meet the increased motor demands.

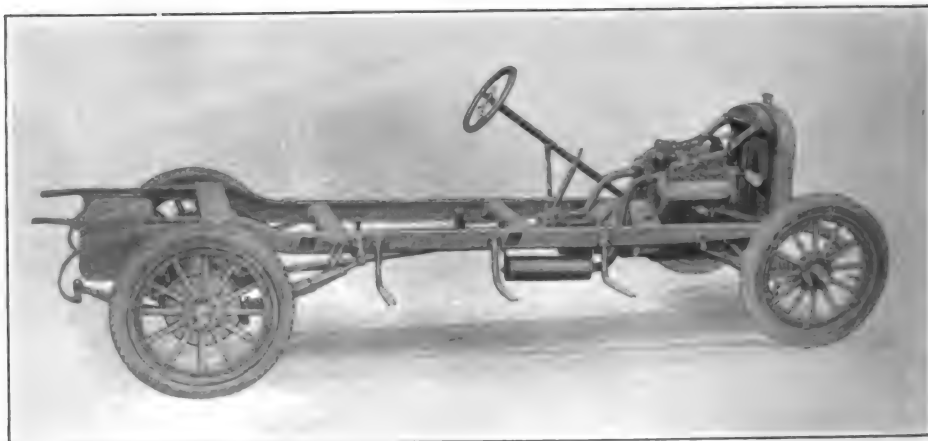
The Jeffery Car Test.

A second test was conducted with a Jeffery car on which a Church tank was installed on a pole, 10 feet above the level of the main tank. With the tank empty and the engine dead it required only 14.4 seconds to transfer fuel into the auxiliary tank after the engine had been started and a pressure of 1½ pounds obtained. This pressure increased to three pounds at a speed of 55 miles.

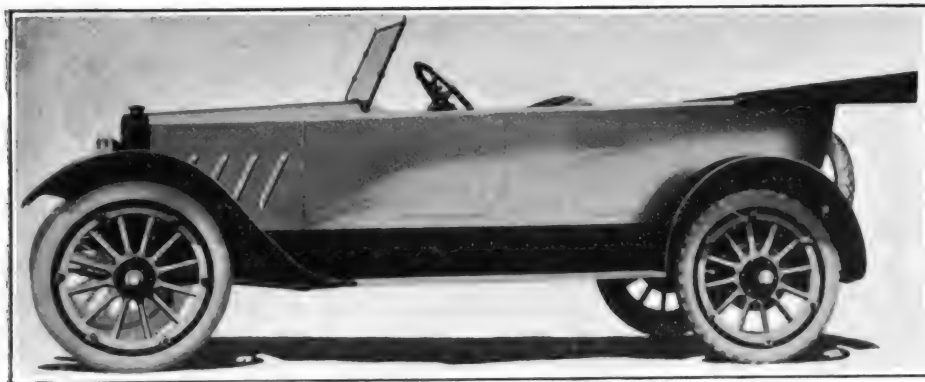
The Church gasoline feed is manufactured by the Automatic Carburetor Company of Chicago, Ill.

BUYING TIRE MILES INSTEAD OF BUYING TIRES.

R. S. Wilson, manager of the service department of the Goodyear Tire and Rubber Company of Akron, O., says: "We are carrying a campaign to motorists to influence them to buy tire miles instead of merely 'buying tires.' To aid motorists in buying these more miles we have prepared a very convenient 'cost per mile chart,' with the aid of which any car owner can in a moment calculate accurately just how much his tires are costing him to turn a mile."



The Car Is Assembled from Standard Parts of Known Value and Performance.



The Four-Cylinder Hackett Car, Price \$888.

Features of the New Hackett Car.

A Moderate Priced Four-Cylinder Car in Which the Appearance of Speed is Characteristic.

HAVING in mind the desire of the majority of car owners to own a machine in which they can take pride in its external appearance, as well as one that is mechanically efficient, the builders of the Hackett car after determining that the mechanism was all that could be desired for a car in its price class concentrated upon the body. The result is four-cylinder, five-passenger touring car, selling at \$888, with an original body design in which the straight lines run from the top corners of the radiator clear back to the rear. In appearance it resembles a speed boat, and in riding comfort an easy chair, according to the claims of the maker, the Hackett Motor Car Company, Jackson, Mich.

The straight line effect is further brought out by the narrow deck extending all around the rim of the body, and also forming the double cowl on the back of the front seat. The seats are low, which further accentuates the effect, and the windshield is set at a rakish angle, which angle is also followed out by the large louvres in the hood.

Three Models Made.

Besides the touring car, the Hackett plans also include a three-passenger runabout at \$888 and a cabriolet at about \$1000. A winter top is offered for the roadster at an additional cost of \$110. In the runabout the driver's seat is set slightly ahead of the other two.

The engine is a $3\frac{1}{4}$ by $4\frac{1}{4}$, L head, high speed, block construction. This size engine has an S. A. E. horsepower rating of 22.5 and piston displacement of 188.2 cubic inches. The maximum horsepower at 2000 revolutions per minute is said to be 36.9. The cylinder head is detachable and the crank case in two parts, the lower half being of pressed steel and used as an oil pan. The carbon steel drop forged and heat treated crankshaft is carried on three main bearings.

Force feed and splash lubrication system is used, the oil being drawn from the reservoir by a plunger pump, which is actuated off an exhaust cam

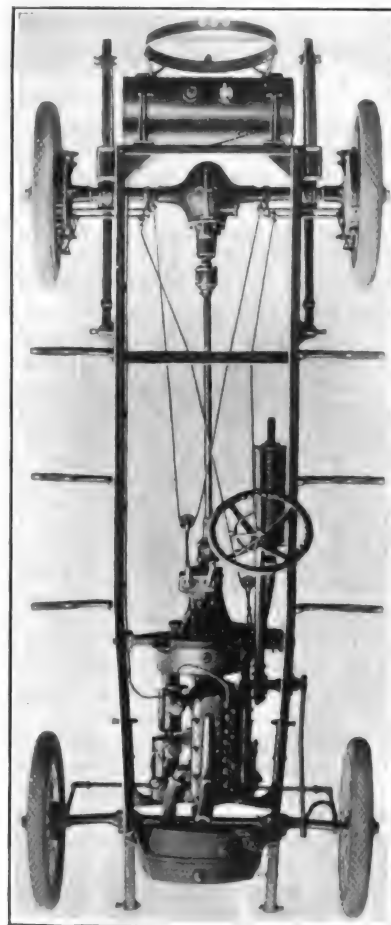
and after passing through a sight feed on the cowl passes on to the three engine bearings. From these bearings an overflow goes to the troughs and is splashed by the connecting rod dips. The oil pump and all piping are carried on the outside of the engine and are consequently accessible. The unusual make up of the valve system includes adjusting nuts on the stems, instead of on the push rods; they act as spring retainers.

Disco Lighting and Starter.

Silent chain drive is employed on the camshaft and the motor generator, which is of Disco make. The adjustment of the motor generator chain is obtained by tilting the bracket on which the instrument is mounted.

Justrite Carburetor Used.

The ignition system is made up of a Remy coil and distributor, which is carried at the front and is driven from the camshaft. The carburetor is a Justrite



The Neat Hackett Chassis.

make, a feature of which is the single jet construction, in which the correct proportions of air and gasoline are obtained by enlarging or decreasing the size of the venturi passage. Fuel is fed from a 15-gallon tank at the rear of the chassis by vacuum system.

Cooling is by thermo-syphon principle and a cellular radiator and a four-blade fan. The starting and lighting system is the two-unit type.

An outstanding feature of the Hackett chassis construction is found in the clutch, which is a G. B. S. make, consisting of a single driven disc of steel



Showing the Speed Boat Design of Body.

against both faces of which rings of wire-wound asbestos fabric are forced. Quiet and smooth action is further insured by running the clutch in oil.

The gearset is the Grant-Lees selective three-speed and reverse, sliding gear type, the main shaft of the transmission being carried on annular ball bearings. The engine, clutch and gearset are in unit, and the two last named are so arranged that they may be removed easily without disturbing the engine.

The rear axle is a Walker-Weiss semi-floating type. The braking system includes two sets operating on one drum on each wheel. The springs at the rear are three-quarter elliptics, 48 by 1½ inches, while those at the front are half

elliptic, 36 by 1½ inches. The front axle is an I beam design, and the steering gear is of the worm and gear type. The steering wheel is 17 inches in diameter.

The wheelbase of this Hackett chassis is 112 inches, and carries a body that is finished in what has become known as Packard blue with ivory white wheels. The wheels carry 32 by 3½-inch Ajax tires and demountable rims.

The upholstery of the interior is French pleated, and the cowl board, a handsome piece of work, has speedometer, oil gauge, gasoline choker, ammeter, lighting switches and instrument light with metal trimmings in heavy nickel finish.

"The six did enjoy a prosperity beyond our most sanguine hopes—but the demand for the four was so hopelessly in excess of our plans for production that we were swamped from the very first.

"We sometimes flatter ourselves that by our advertising we create a demand for a certain type of car. A glance at the order books, however, soon takes the conceit out of us and proves that no matter what we may want the customer to want he insists on wanting anything he likes.

"The single cylinder is the most economical consumer of gasoline, and by the same token the four is more economical than the six; the six than the eight; the eight than a 12; a 12 than a 16. Granted, always, of course, that the same engineering ability enters into each and nowadays there's not so much difference between engineers as rival advertisers would lead you to believe.

"Of course we expect to sell a lot of sixes in the future, simply because a certain proportion of buyers must have a seven-passenger car, and it goes without saying that it costs more to carry seven passengers than to carry five. But it's useless to try to prove to the man who is driving a car every day—who is looking at his speedometer at the same time that he pays for his gasoline—that a car with more cylinders is as economical as a four to drive. It won't go down. You pay for what you get; that's the answer.

"If people felt that they got enough more in a car with twice the cylinders they'd be willing to pay the difference, but anyone who has observed carefully the trend of the demand in the past two years, during which time we have gone to the extreme in the matter of cylinder multiplication, must admit that, in spite of all the manufacturer may do, the customer is going to continue to want and to have fours."

SAYS FOUR CYLINDERS DOMINATE.

R. C. Rueschaw, Reo Expert, Advances Claim and Gives Reasons for His Belief in Fours.

R. C. Rueschaw of the Reo Motor Car Company predicts that "four-cylinder cars will from now on and forever more dominate the field."

In explaining his reasons for this radical prophecy Mr. Rueschaw says:

"Considered in the light of the fact that the past year has seen more multi-cylinder cars than ever before; we've had a plethora of 12's and eights, not to mention the six, which has become standard in the larger sizes, still I maintain that all signs and portents point unerringly to the four as the standard car of the future.

"When you get right down to brass tacks you will find that there never was any engineering or mercantile reason for cars above four cylinders.

"In saying that I'm not forgetful of the fact that a very large proportion of the Reo output is sixes. I am certain that the six will continue to be popular with a certain class of buyers. It will always be popular with that class of people who want a car of exceptional passenger capacity. No, I didn't say speed, because, as a matter of fact, all world's speed records are held by fours. But when you come to passenger capacity, say, for seven people, it is better engineering practise to add two cylinders than to increase the bore of the four cylinders you already have.

"But the seven-passenger car will not be the standard automobile. The five-passenger car will always be that, because the average family is five. And that is why I say that the four will dominate from now on.

"Of course, being an enterprising people and prone to 'fall' for anything in the form of a novelty, we Americans had to satisfy that propensity by first experimenting with cars with as many cylinders as we could think of. We always do that. We always carry things to an illogical conclusion before we are satis-

fied to settle back to sanity.

"During the past two years we have tried that, and, like the man who has once flown to the maximum height an aeroplane will carry him, we are now satisfied to keep a little closer to terra firma.

"We manufacturers need not flatter ourselves that we have discovered the superiority of the four. On the contrary it is the customer who has discovered it, and inasmuch as the customer has always been the court of last resort, his decision will stand and we makers will build to meet his demand, not our preference.

"Just take the case of Reo during the past year. We felt certain that the Reo six would outsell the four. Planned to make them in almost equal ratio.



November.

Race (Speedway), Los Angeles..Nov. 30

December.

Show, Springfield, Mass.....Dec. 2-9
Celebration, National Electrical Dis-

playDec. 2nd

Show, Akron, O.....Dec. 9-16

Race (Speedway), Los Angeles..Dec. 2

Show, Cleveland, O.....Dec. 30-Jan. 6

January.

Show, New York City.....Jan. 6-13

Convention, S. A. E., Mid-Winter Meeting at New York City.....Jan. 9-11

Show, Cleveland, O.....Jan. 13-20

Show, Montreal, Que.....Jan. 20-27

Show, Rochester, N. Y.....Jan. 22-27

Show, Oklahoma City, Okla...Jan. 22-27

Show, Buffalo, N. Y.....Jan. 29-Feb. 3

Show, Chicago.....Jan. 27-Feb. 3

February.

Show, Minneapolis, Minn.....Feb. 3-10

Show, San Francisco.....Feb. 10-18

Show, Kansas City, Mo.....Feb. 12-17

Show, St. Louis.....Feb. 18-25

Show, Duluth, Minn.....Feb. 19-24

Show, Des Moines, Ia.....Feb. 19-24

Show, Omaha, Neb.....Feb. 26-March 3

Show, Newark, N. J.....Feb.

March.

Show, Boston, Mass.....March 3-10

Show, Fort Dodge, Ia.....March 6-10

April.

Race (Road), Los Angeles to Salt Lake City.....April



Pleasure Cars in the Rhode Island State Armory, Showing Venetian Scenery and Beautiful Decorative Effect.

Providence Automobile Show a Brilliant Success.

Large and Representative Crowds Throng Rhode Island State Armory All Week and Exhibit Genuine Interest in Displays.

THE Providence, R. I., automobile show, the eighth annual event held in that city by the Rhode Island Automobile Dealers' Association, closed in a blaze of glory on Saturday evening, Nov. 18, all exhibitors agreeing that it was the most successful ever held in Providence.

In point of attendance, Wednesday night, which was known as Society Night, was the greatest of the week. On that evening attention was about equally divided between the shining new motor car models and the exceedingly well dressed spectators, conspicuous among whom were many of Rhode Island's and Eastern Massachusetts's leading citizens.

The decoration of the State Armory was suggestive of Venice. There were drapings of buntings, mural paintings and thousands of tungsten lights. The whole setting made an excellent background for the cars, while well known orchestras entertained the throngs with classic and popular airs.

There were over 260 vehicles on display, including 20 different makes of commercial cars. All the leading manufacturers of pleasure and business cars were represented by one or more models, some of them displaying stripped chassis and cutaway motors for the educational benefit of spectators. Closed car models were there in plenty, and these attracted much attention. One new feature of this type of car, which was prevalent on sev-

eral of the best known models, was the handle like arrangement by which the glass window panels could be quickly and quietly let down into the body and out of sight.

Salesmen at the different exhibits reported an unusual interest, especially in the enclosed body types, and said there were many more actual sales closed during the show than at any previous event, although they were divided up among a larger number of dealers. The commercial car department, which was located with the accessories in the basement of the armory, also reported "fine business."

The pleasure cars shown were:

Allen, Auburn, Buick, Biddle, Cadillac, Chalmers, Chevrolet, Chandler, Cole, Detroit Electric, Dixie Flyer, Dodge Bros., Dort, Franklin, Grant, Haynes, Hudson, Hupmobile, Inter-State, Jeffery, King, Locomobile, Marmon, Mercer, Mitchell, Moon, National, Oakland, Oldsmobile, Overland, Owen Magnetic, Packard, Paige, Peerless, Pierce-Arrow, Reo, Roamer, Scripps-Booth, Stearns-Knight, Studebaker, Stutz, Sun, Velle, White, Winton, Woods Dual Power.

ON A 10,000-MILE MOTION PICTURE TOUR.

A 10,000-mile motion picture tour is being made by Mr. and Mrs. Ralph Earle of San Francisco, Cal. They are travel-

ing in a Buick roadster equipped with 32 inch by four inch Republic staggered treads and will be on the go until some time next spring. They will visit the national parks in the United States in the interests of Pathe Freres, the motion picture company. The scenic beauty and grandeur of these parks will be filmed for public display.

TOURISTS PROTECTED AGAINST EXTORTION.

A schedule of maximum prices has been established by the American Association of Garage Owners, which will apply throughout the country wherever its members conduct a garage or repair business. This action was taken by the members to protect the tourist against extortionate rates.

The schedule fixed is the maximum. Many members charge a lower rate, charges being governed by localities and working conditions. The schedule is as follows:

	Towns over 10,000	Towns under 10,000
Machinist, class A, per hour	\$1.00	\$0.75
Helper, class B, per hour..	.60	.50
Apprentice, class C, per hour	.40	.30
Tourist storage, per day....	1.00	.75
Tourist storage, per week..	5.00	3.00



Chalmers Convention Hall.

FOR several years the American makers of motor cars have been held up to an admiring public throughout the world as models of efficiency. The greatest stress has been laid upon the mechanical equipment with which they are provided so as to turn out their cars rapidly enough to meet the enormous demand that has been prevalent for years. It is a subject indeed worthy of any writer's pen, and the methods employed could beneficially be adopted by older industries.

There is one phase of the automobile industry that has not received due consideration, and that is the treatment of the human element that enters into the production of motor cars. In this department the automobile industry as a class indeed is far superior to any other in this country or Europe. Almost as much thought has been devoted to the matter of giving employees the best possible environment as has been expended in laying out the mechanical equipment.



Pierce-Arrow Factory Push Cart Store.

Factory Welfare Several Pleasure and

Huge sums of money have been spent to obtain the best possible welfare apparatus. But the manufacturers do not stop here, leaving the employees the subject of cold routine; the officials literally take off their coats and mingle with their workmen and workwomen, co-operating with them in every endeavor that will lead to the best possible working conditions and personal betterment.

Almost without exception the welfare department is one of the chief branches of the American motor car manufacturing. At the head of page 22 is an illustration of the Chalmers Motor Company's conventional hall in the Detroit factory. It appears to be a school or lecture room, and that is exactly what it is, in its primary sense, for here the salesmen of the company foregather on stated occasions to learn the finer points of selling. This hall is also used for meetings of the Chalmers Men's Club, and the Chalmers Girls' Club, two thriving social organizations composed entirely of employees.

The Chalmers company has given much attention to the welfare of its workers. It has opened and equipped a large but cozy dining room, where the employees can get pure and wholesome food at cost prices. The young women in the factory have a special and ultra private rest room, fitted with rugs, palms, tables, rocking chairs and couches. Not the least attraction is the Victrola supplied by the company.

The Pierce-Arrow Motor Car Company, Buffalo, N. Y., probably has gone further in the matter of factory welfare



The Inner Man Receives Much Consideration by the Pierce-Arrow Company; at the Left is a View of the Model Bakery; at the Right

is the Thoroughly Modern Kitchen, Where Meals Like That Shown at Bottom Are Prepared. This Meal Would Ordinarily Cost 50 Cents.

As Practised by Makers of Business Cars

than any other. It began this kind of work in 1906 and now its welfare facilities are tremendous—these are described in a booklet published by the company. At the centre and bottom of page 22 are four Pierce-Arrow views, the oval showing one of the three push cart stores which are sent around the factory during working hours to dispense, at nominal cost to the workmen, candy, tobacco, cigars, etc. The lower group shows how Pierce-Arrow cares for the inner man, the view at the left being the huge and model bakery; at the right, the very well equipped kitchen, and at the bottom the meal that is served to employees for 15 cents in the great dining hall that will seat 900 men. This meal, which is served at noon, consists of soup, meat, potatoes, various vegetables, such as rice, beans or turnips, with bread and butter and tea, coffee or milk. The menu is changed every day.

The Willys-Overland Company, Toledo, O., has a thoroughly equipped industrial welfare department, including dining halls, rest rooms, schools for workmen, outside playgrounds and benevolent associations. The view at the top of page 23 shows one corner of the Girls' Emergency room, where a nurse is always in attendance. This is one of the features of the new nine-story Overland office building.

The oval illustration is a view taken in the Cole Motor Car Company's plant at Indianapolis, when more than 500 employees were immunized against typhoid when it was epidemic in Indianapolis a short time ago. The treatment was



Overland's Emergency Room.

given at the expense of the company, and is only one instance of how Cole cares for its workers. In the left side of the view one can see C. P. Henderson, general sales manager.

At the bottom of the page is a group of views taken in the Packard Motor Car Company's plant at Detroit, showing the complete Packard hospital for employees. This company goes deeply into educational facilities for its workmen, having classes in mechanical drawing, shop mathematics and elementary English. There also is an apprentice school where young men are trained to become foremen, assistants and holders of other positions requiring special training. Other features of Packard welfare include rest rooms for women employees, a large recreation room where motion pictures, lectures, sales and service instruction and other such activities are conducted. There also is the Packard band of 40 pieces, which has made a name for itself in Michigan. The Packard recreation league is an employee's organization that indulges in all forms of sport.

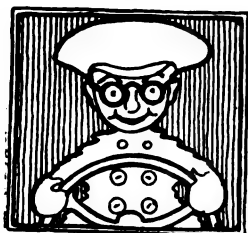


Immunizing Cole Employees Against Typhoid.

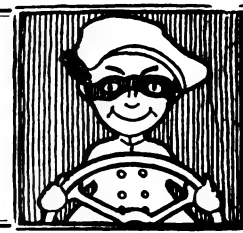
Three Views of the Packard



Company's Excellent Hospital.



Graphic Items



Howard Baker of San Francisco, Cal., who first saw the light of day on June 18 of this year, has attained fame earlier in life than most people, as he is already acknowledged the champion tourist of



his age in this or any other country. He has traveled no less than 5500 miles in a Briscoe roadster, sleeping in a cradle swung from the underside of the top. He has spent his days since his birth out of doors, both night and day, and is a healthy exponent of the outdoor life.

The police of Portland, Me., have issued warnings to owners of cars that wherever the cars are in the night time, whether running or standing still, they must be provided with lights and that failure to live up to this provision of the law will result in prosecutions.

The Colombian government has started work on the new northern highway which will run from Bogota to Cucuta, and when this section is completed a branch road will be built to Bucaramanga. A road will also be built from Alban to the Magdalena river, the work on which will be done by convicts.

To eliminate the danger of collisions at the intersections of two highways in East Cleveland, O., John D. Rockefeller dedicated a triangle of land at the corner which when graded down gave a sufficient view from both angles to prevent any accidents that might result from drivers being unaware of the approach of a car from the opposite direction.

The State Highway Commission of the State of Washington is conducting a campaign against the practise of posting advertising matter on the state highway signs along the roads. There is a law prohibiting this practise and the officials intend to see that it is enforced.

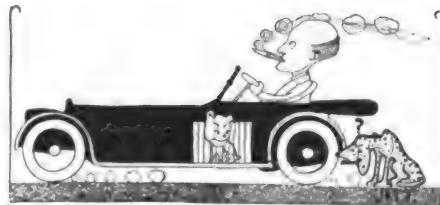
A motorist of Worcester, Mass., prob-



ably has the distinction of being the first driver in the world to be arrested and sentenced to imprisonment for driving his automobile too slow. He was brought before the court on the charge that he was driving so slowly his machine obstructed traffic and received punishment in the form of a sentence of two months in the house of correction.

The automobile in Haiti has met with little appreciation owing to the poor treatment received by the early owners on the island. In 1913 there were some 20 automobiles around Port au Prince, while at present, aside from the machines used by the Marine Corps, there are not over four now running, and one of those belongs to the American minister. The price of gasoline, 60 cents a gallon, is another detriment to their use.

A motorist of Pasadena, Cal., who enjoys having his pet dog accompany him on his trips, had a blacksmith build a small iron lattice, which he attached to the running board of his Dodge car. The dog, when formerly riding on the board, used to fall off occasionally and injure itself, but he now travels about in se-



curity, ensconced behind the iron wicker.

The law makers of Bermuda have decided to repeal the laws prohibiting the use of automobiles and will enact new legislation which will permit of a restricted motor omnibus service between Hamilton and St. George and Hamilton and Somerset.

There are now 7000 automobiles in the Netherlands, which is double the amount owned there four years ago. A larger increase would have been noted, it is stated by the United States Consul at Amsterdam had not the war interfered with the importation of accessories, particularly tires. The latter condition is so acute that people will not buy machines because they cannot get a guarantee that they will be able to buy tires.

The electrical supply department of the city of Melbourne, Australia, has opened a charging station for electric automobiles which keeps open day and night. The charge for current is two cents per unit between the hours of 10 p. m. and 8 a. m. and 3½ cents per unit at other times.

The high cost of living and general elevation of the plane of existence in the United States has effected "hobodom" to such a pitch that many of the fraternity are tabooing the freight cars and are rid-



ing in all kinds of motor cars from flivvers to twin sixes. Only the higher class tramp, however, succeeds at this game; tourists and other motorists are a trifle suspicious about picking up a stranger clad in conventional hobo attire. One of these knights of the road recently claimed that he had travelled in this way from Miami, Fla., to New York City, and was about to start on a grand tour to San Francisco as soon as he encountered a good natured automobilist headed for Yonkers, which was to be the first lap of the journey.

The police of Detroit will share in some of the Ford profits. James Couzens, a director of the Ford company, who was recently appointed commissioner of police, is to donate his annual salary of \$5000 and an additional \$5000 to a fund to be used in paying bonuses to the members of the police force. The efficiency record of each policeman will be kept and the bonuses will be paid every three months.

Work on the construction of the Old Colony boulevard, which will shorten the distance between Boston and Nantasket, Mass., by six miles, will be started as soon as the mayor and council of Boston approve the property takings of the metropolitan park commission of that state, which are necessary to carry out the project.

The Goodyear Tire & Rubber Company of Akron, O., is conducting a school for the foreign born employees. The lessons are made interesting and enjoyable for the scholars and they are also taught to sing the national anthem and other patriotic songs.



A new state traffic law has been passed in Mississippi which makes a number of changes in the regulations governing the operation of an automobile in that state. A speed limit of 30 miles an hour is fixed for country roads, while 15 miles is the limit in incorporated towns. If the road is less than 20 feet in width, however, the speed limit is 10 miles an hour and in passing a pedestrian or automobile the operator is obliged to slow down to eight miles. Heavy penalties, including jail sentences are imposed for violation.

Merchants in New Britain, Conn., are vigorously opposed to the new parking

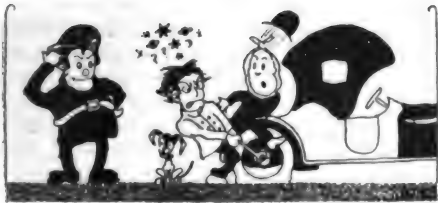


regulations which forbid owners to leave their motor cars on certain sections of the main business street more than five minutes.

Some of the men incarcerated in Sing Sing prison are learning to be efficient automobile mechanics and there is such a demand for this class of training that this branch of the vocational training department of the welfare league has a waiting list of twice the number of men already engaged in the work.

At a meeting of the sign post committee and board of governors of the Automobile Club of Hartford a movement was started for making many improvements for the convenience of tourists throughout the state. One of the principal things discussed at the meeting was the proposal to put sign posts or markings showing the town lines on the various highways.

A number of Texas dealers gathered in Dallas recently and soon began to swap stories about motor cars. The story that



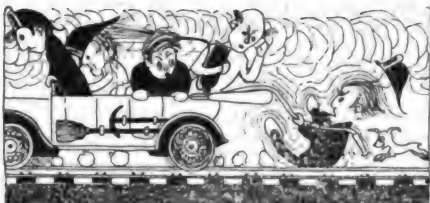
ended the seance was as follows: "My dentist friend was driving his Dort one day; tire blew out. Had spare on behind. Was five miles out of town. Got down to make the change. No monkey wrench or pliers in tool box. Had a pair of forceps—things you pull teeth with you know, in his pocket. Used 'em. Made the change O. K. Came back to town. Honest!"

Equipping the Ford to obtain home-like comforts has surely been achieved by a Rhode Island owner. The rear seat is fixed with a set of hinges so as to provide a most comfortable bed. Protection



from the elements at night is obtained by means of a heavy canvas. Cooking utensils and a gasoline lamp are carried in a box at the rear. On one mud guard is a hen coop with ample room for six Rhode Island Reds. In the driver's compartment is a typewriter, and automobile supplies of every description are carried on the mudguard unoccupied by the hen coop. Hot and cold water is carried in thermos bottles, and a system of "home made" wiring provides illumination for the tonneau at night. Thus he has every convenience except running water and shower baths.

Rangers in the Sierra National Forest, California, have abandoned horses to a large extent in their work of preventing and fighting timber fires and have taken up Ford cars. In one instance the regular wheels were replaced by flanged wheels that would run on railroad tracks.

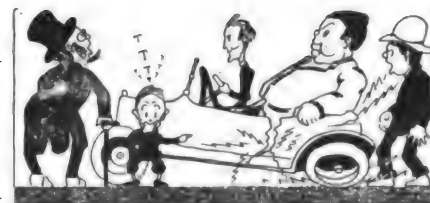


Several minor changes were made to fit the car for its purpose, and it was equipped with full apparatus for fire fighting.

Although your license document will not keep you warm these days, it may be the means of saving you a warm time with the authorities that be, if you are found on the road without it. Fifty motorists were stopped recently in a Vermont town and were unable to show theirs.

Acting in accordance with rules and regulations issued by the Kentucky state fire marshal, the city building inspector of Louisville is now refusing permits for construction of garages unless they are fireproof or made "as slow burning as possible."

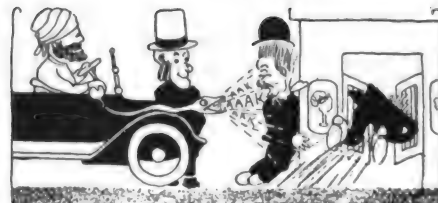
The people of Toledo, O., recently witnessed one of the most unusual sights that ever met their gaze in a passing automobile. The thinnest man in the world



was giving the champion fat man a ride in an Overland car. Some idea of the fat man's size may be gained from the fact that he seemed to bulge out the tonneau of the five-seater, while his driver appeared slightly heavier than the steering column on the machine.

Jitneyism is on the decline in several parts of the country. Only 306 had registered this year in Milwaukee up to a recent date, as compared with 1314 certified during 1915.

Dipsomaniacs in Baroda, India, are said to have made themselves scarce on



the streets of that place lately owing to the appearance of a fiendish device employed by one of the princes to warn pedestrians from his path. The princes' tube and horn is designed in the form of a large, long snake, with its tail reaching into the driving seat, where it is connected onto a bulb and the body stretching out along the fender to the radiator, where the head takes the place of the customary horn. The snake's mouth is wide open and when the bulb is pressed it issues a mournful but effective warning. The designer of this weird device, as might be expected, is a man by the name of Dhairyashihao.

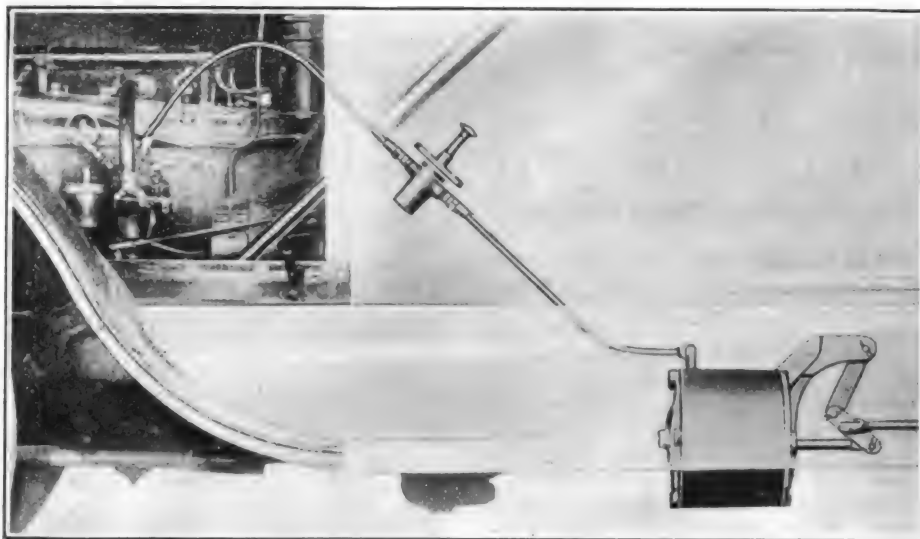
A veteran driver of motor cars who has never had an accident in 10 years of operating a motor car says he makes it a rule to watch the front wheels of the other fellow's car, rather than watching the driver. This is a useful hint.

The New York police department is said to be the first in the world to equip a motor truck with a wireless telegraph outfit to apprehend criminals, call out reserves in case of riots, etc. Most of the

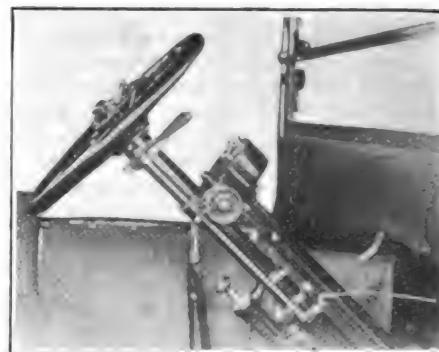


station houses have wireless equipment and with the outfit on a police truck the police need not worry even if telephone and telegraph wires are out of commission.

In Baltimore motor cars or other vehicles are not allowed to stand on any street, lane or alley for more than two hours from 8 a. m. to 8 p. m., nor longer than 3½ hours at other times, without special permit from the Board of Estimates. This is a recent city ordinance and it is being strictly enforced.



In the Phantom View the Prest-O-Vacuum Brake Is Shown Operated by a Pedal, with the Control Valve on the Tube Connecting the Intake Manifold and the Braking Cylinder.



In This View the Lever Control Is Carried on the Steering Column.

Braking with the Intake Suction.

A New Method of Stopping the Car, a Touch of Hand or Foot Exerting 1000 Pound Pull

SELF-STOPPER is the term used to describe the new Prest-O-Lite vacuum braking system that has been evolved by the Prest-O-Lite Company of Indianapolis. In this system the suction or vacuum of the intake manifold is utilized to supply almost any desired pressure at the rear wheels simply by the touch of foot or finger.

The mechanism of the brake consists of a 12-pound cylinder, containing a leather faced piston, a lever for connecting to the brake rod, a small controlling valve and the necessary copper tubing to connect from the intake manifold to the valve and from there to the vacuum cylinder. Although the system embraces the same sort of cylinder and leather faced piston used on railway car and street car brakes, it is not a pneumatic air brake—there is no air compressor or air storage tank.

In operation the suction in the intake manifold exhausts the air from the cylinder and forces the piston to move and apply the brakes through the usual braking system. The pressure of the brakes depends upon the suction in the brake cylinder, and this is controlled by the operator through a throttle valve actuated either by pedal or hand lever.

When the engine is running the vacuum in the intake manifold exerts a suction force equal to about 10 pounds pressure to the square inch. This pressure through the ingenious construction of the Prest-O-Vacuum brake, is built up through leverage to more than 1000 pounds pull at the rear wheels. This power is abundant to operate any brakes, even though each brake were unequally adjusted.

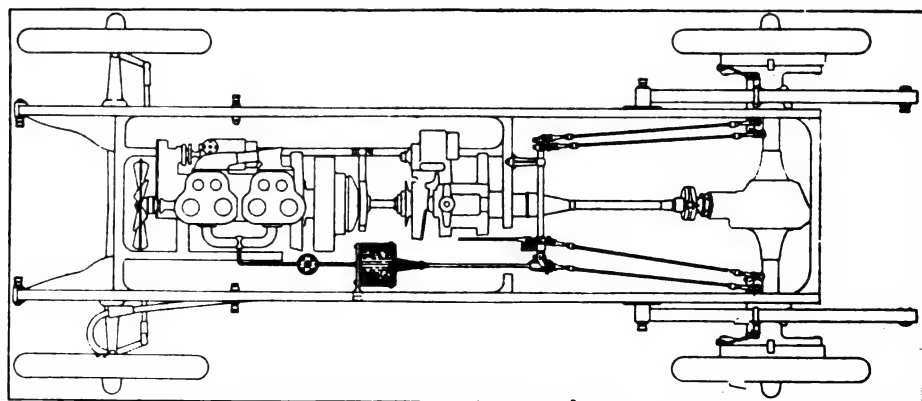
Since the vacuum brake is operative only when the engine is turning over, it is applicable only to the foot or service brake, the hand or emergency brake still being necessary when it is desired to lock the wheels on a grade with the engine idle. The power available for braking purposes is well illustrated by the fact that with the engine stalled and the car moving forward on high gear at a speed of two miles an hour, there is still enough motion in the intake pipe to lock the rear wheels instantly. To further illustrate, with the gear lever in neutral and the engine not running, the application of the electric starter to turn over the engine, or even a slow turning by hand crank, creates enough suction to apply the vacuum brake to its full extent.

The controlling valve is a simple but ingenious two-way device, which when opened allows the suction of the engine

to operate to the desired extent in the vacuum cylinder, and when closed allows air to rush into the vacuum cylinder, releasing the brakes. The valve is so designed that the brake may be applied either very slightly or instantly to the full extent, or may be applied or released to any degree between the two extremes of power, and at the will of the operator.

The vacuum cylinder is partially filled with oil, which keeps the leather facing of the piston pliable. Occasional lubrication at the controlling valve, and only to the same extent as required by spark and throttle connections, is all the attention required from the operator. The drilling of one hole in the intake manifold and the attachment of the lever to the brake rod are the only changes required in the operative parts of the car. Even the boring of a hole in the intake manifold is unnecessary when the car is already equipped with a vacuum gasoline feed, in which case a two-way union may be installed and suction for the brake may be had through the same aperture which supplies suction for the vacuum gasoline feed.

The advantages of the vacuum brake are quite similar to those of the electric cranking system. Both are intended to reduce the physical exertion of the driver and to eliminate certain risks attendant upon uncertain application of mere muscular force. In fact, the self-stopper has certain advantages over the self-starter, in that its mechanism is very simple. The source of power being the engine itself it is practically infallible so long as the engine is in motion—when it is not in motion the brake is not needed of course.



This Shows How the Brake Is Applied to the Average Chassis, and How It Is Attached to the Point of Junction of the Intake Manifold with the Carburetor Pipe.

**HINTS FOR HANDLING NUTS.**

(Figure 262.)

When a thread has become so badly damaged that a nut cannot be replaced, and a standard die is not available for rethreading, a steel nut of proper size can be used successfully. The nut should be annealed and a V slot cut across the threads and into the body of the nut, as shown in the sketch at A. Use a very fine file so that burrs will not be raised. Next temper the nut in the customary manner, after which screw the improvised die on the thread several times and the irregularities will be removed. Different sized steel nuts can be treated in this way and the owner will have a set by which he can perform work as well as by the more expensive stocks and dies.

Another handy device to have about the garage is a spanner, similar to that shown in the sketch at B and C. The spanner consists of a piece of steel stock cut to fit over the nut, and having a lip against which to strike a hammer or other tool to start a nut that is rusted in place. If the nut itself is struck it is liable to become badly damaged.

A PRACTICAL REPAIR HINT.

(Figure 263.)

If a spoke of a pulley or gear becomes cracked it can be easily repaired and restored to service by adapting the repair method shown in our illustration. It consists simply of drilling a hole through the metal and in the centre of the fracture and inserting a rivet. The rivet heads will prevent any side play in one direction and the shank will check the tendency of play at right angles.

In this way the weakened parts of the spoke will be held rigid in the severest of service.

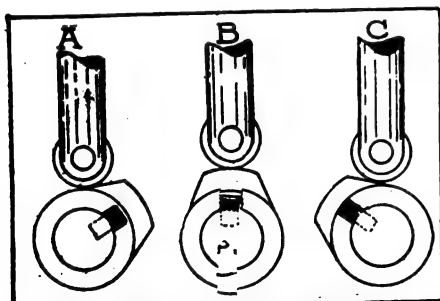


Fig. 265—Worn Camshaft Keys.

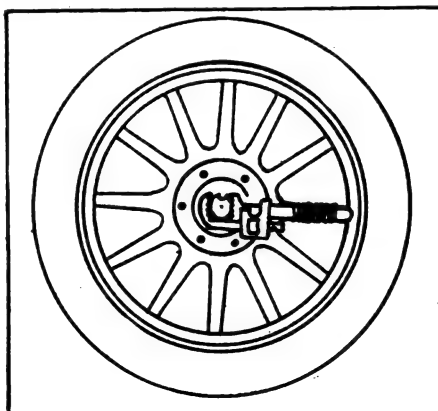


Fig. 264—A Pipe Wrench Repair.

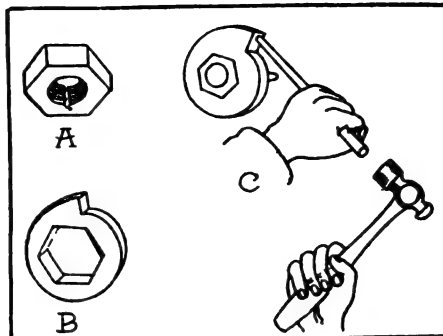


Fig. 262—Hints for Handling Nuts.

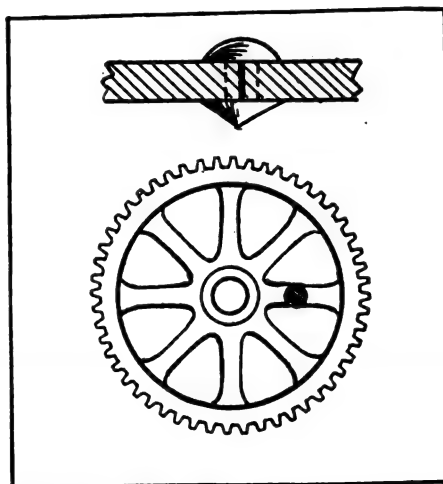


Fig. 263—Repairing Gears.

EMERGENCY WHEEL REPAIR.

(Figure 264.)

Should the hub casting in the rear wheel of a motor car become so badly damaged that it cannot be driven by the key in the axle, an emergency repair can be made as shown in the sketch. Fit a strong pipe wrench tightly on the axle and strap the handle to a spoke of the wheel. In this way the power will be transmitted from the axle to the wheel without the aid of the key. The wheel may wobble quite a bit when the car is running, but it is almost impossible for it to come off or loosen the grip of the wrench.

WORN CAMSHAFT KEYS.

(Figure 265.)

A cause of motor knocks on the earlier makes of cars is often found at the camshaft, usually because the keys that fasten the separate cams to the shaft are worn. In operation the valves are ordinarily kept seated by means of strong spring, and, as the cam starts to lift the valve, as shown at A, the resistance of the spring is sufficient to bring the side of the key slot into forcible contact with the key until the cam fully lifts the plunger, as shown at B. After passing the central point, as at C, the force of the spring tends to push the cam ahead of the shaft, with the result that the opposite side of the slot is forced sharply against the key, in which position it remains until reaching A again. The knocking of the loose cams is heard most distinctly at high throttle.

HAND GUARD.

(Figure 266.)

Anyone who has had occasion to cut sheet metal with the ordinary hand metal shears knows that the metal has a de-

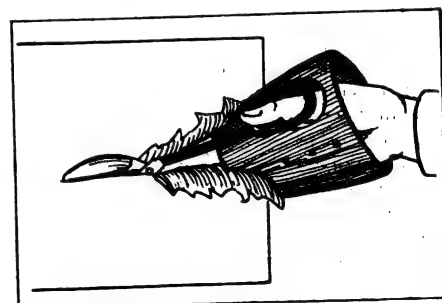


Fig. 266—Home Made Hand Guard.

cided tendency to roll over, which often results in nasty scratches and oftentimes quite serious cuts. The edges of metal so cut are ragged and sharp and easily tear flesh or other things that come in contact with them. To protect one's hand from this danger a shield is often used. This may be made of a substantial piece of tough leather, but not so stiff that it will not be pliable and flexible. This is cut so as to fold as shown in the sketch and is held by a clasp so as to enclose the hand and one arm of the shears. The thumb being practically free from danger is left out of this shield. This interferes in no way with the cutting of the metal and saves many a bad scratch or cut which if neglected might develop into serious complications.

SPARK PLUG TIRE PUMP. (Figure 267.)

The owner of a car that is not provided with a power tire pump can easily make one that will operate from the spark plug opening. The pump consists of a poppet valve inlet and an outlet attachment suitable for attaching an air hose. A butterfly valve should be placed in the manifold to make it possible to shut off the flow of gas and it should be designed so that it is possible to lock in either open or shut position. The method of attachment is shown in the sketch, as is the location of the butterfly valve.

SMOOTHING A BORE. (Figure 268.)

A small portable electric motor can easily be used to smooth up the inside of a bore as follows: Turn up a piece of stock, one end of which is of a size to fit into the chuck of the electric drill. Turn up the other end smaller than the hole to be finished and cut a slit in it as shown. Insert one end of a strip of emery cloth through the slit and wind it around the shaft a few times in the opposite direction from that in which the shaft rotates. Clamp the electric drill, with the attached shaft and emery wheel affixed, in a vise and run the piece to be smoothed back and forth over this shaft. Of course, different grades of emery cloth may be used to get as fine a surface as desired. The whole outfit can be easily moved about in a short space and will prove a great saving in time as well as giving a better finish than can be obtained by hand work.

JAR STAND. (Figure 270.)

In putting on paper gaskets, or replacing rubber hose connections, it is the usual custom to use shellac as a means of making an absolutely tight binder. As a matter of convenience a small jar or bottle is used to hold this, being more easily portable. However, by the nature of its size and shape it does not always maintain its equilibrium and when a bottle of shellac does tip over it is usually "some mess" to use the vernacular of the street.

A simple stand which will tend to pre-

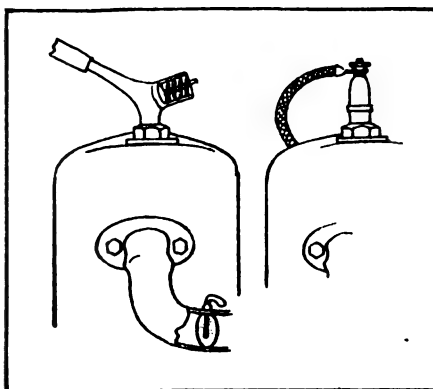


Fig. 267—Simple Tire Pump.

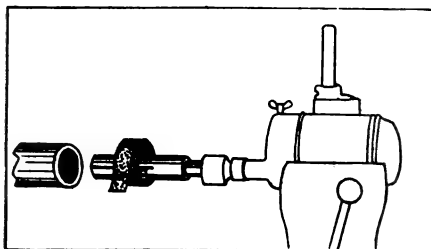


Fig. 268—Smoothing a Bore.

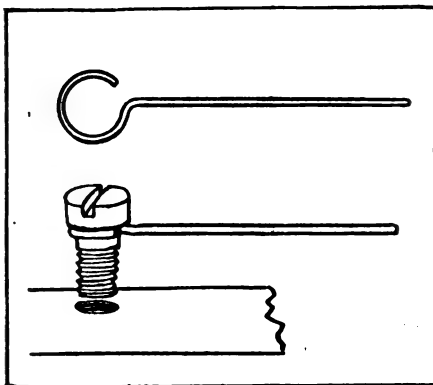


Fig. 269—Handling Small Screws.

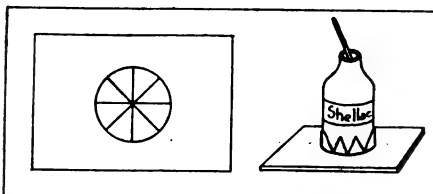


Fig. 270—Shellac Jar Stand.

SEVERAL readers have asked if we would publish in this department some of their ideas for simplifying methods of repair and maintenance of motor cars. The Editor promptly advised that he would, explaining that this department is a sort of clearing house of practical ideas of that nature. If you have any practical suggestions and want to pass them along to other readers, just outline them briefly (on a post card if you desire) and draw a rough sketch. Do not strive for literary style; we will attend to that and will give you credit for each item, using initials or a pseudonym if you desire.

vent just this kind of a mishap is illustrated herewith. It may be easily made by anyone as follows: In the centre of a piece of brass or sheet iron about a sixteenth of an inch thick, having a length or breadth at least twice the diameter of the base of the jar or bottle to be supported, draw a circle having a diameter just barely larger than that of the bottle. Lay off the circle into eight parts, drawing diagonals as shown. Cut along these diagonals and bend along the circle drawn. Now having bent the triangular shaped projections into an approximately perpendicular position, place the bottle as shown.

HANDLING SMALL SCREWS. (Figure 269.)

There are numerous places about a motor car in which it is practically impossible to hold a small screw and use a screw driver upon it at the same time. In such cases make at one end of a piece of thin wire a loop of a diameter equal to that of the body of the screw. When the screw is placed in the loop it can be held steady and can be easily inserted in the hole. After the thread has caught the wire, being soft, can be pulled away.

If tires begin to show wear on one side, from running in ruts or other causes, it is a good plan to turn them around; in that way the life of the tire may be prolonged.

A common nut drilled out so that it only contains 50 per cent. of a full depth thread will break the bolt before it will strip.

Having scraped a motor clean of carbon it is said that the formation of more carbon may be prevented, or at least greatly hindered, by painting with a very thin coat of paraffin.

As a prevention against skidding it is recommended to install non-skid tires, and if not possible to put on four use two, putting one on front and one on the rear wheel diagonally opposite.

To fill holes in castings, etc., use a metal that expands instead of contracts upon cooling. One such metal may be made of nine parts lead, two parts antimony and one part bismuth.

To remove rust quickly from iron parts wash in a solution made of one part nitric acid, one part muriatic acid and 12 parts water. After washing in this the parts should be thoroughly washed and rinsed in clean water.

To "soften" files cover with oil and hold over a fire until the oil blazes. When the flame runs all over the file plunge into water.

To harden files dip in red hot lead, handles up, which gives a uniform heat without warping. Run the file back and forth in a pan of salt water, then set it in a vise and straighten while still warm.

Pierce-Arrow Changes Hands.

**Syndicate Formed to Take Control of
Old Buffalo Company—Manage-
ment Remains Unchanged.**

The Pierce-Arrow Motor Car Corporation, which has been formed by a syndicate of New York bankers, with a capital of 100,000 shares of eight per cent. convertible preferred stock and 250,000 shares of common stock without par value, has acquired control of the Pierce-Arrow Motor Car Company of Buffalo, N. Y. The banking firm of J. & W. Seligman & Co., of New York City, will underwrite the new issues.

Col. Charles Clifton, who is treasurer of the old company, will succeed George K. Birge as president, but otherwise the organization will be unchanged.

The new preferred stock is to be redeemable at 125 and can be converted for the common on a share for share basis. The financing plan also includes the provision that for every dollar in excess of \$5 a share paid on the common stock, \$1 be set aside for the purchase of preferred stock. The existing stock of the old company will all be acquired and it is planned to retire the \$1,250,000 of six per cent. bonds Feb. 1 next.

The Pierce-Arrow company is understood to be earning about a half million dollars a month and should have on Jan. 1, 1917, about \$15,000,000 in assets, including real estate, buildings, equipment, inventories, cash, etc. The earnings, after deducting depreciations, since 1912 have been as follows:

July 1, 1911, to June 30, 1912..\$2,142,000
July 1, 1912, to June 30, 1913.. 1,464,000
July 1, 1913, to Dec. 31, 1914.. 1,714,000
Jan. 1, 1915, to Dec. 31, 1915.. 4,301,000

The profits before depreciation for the seven months ending July 31, 1916, were \$1,660,000; for the month of August, \$540,000; for September, \$560,000. This makes a total of \$2,760,000 for the nine months, which after deducting depreciation, shows a net profit of \$2,460,000.

The expansion of the concern is not expected to effect the pleasure car, but possibly will the Pierce-Arrow truck line.

TEMPLARS MOTOR CORPORATION FORMED IN CLEVELAND.

Four different models of pleasure cars will be manufactured by the Templars Motors Corporation, which was recently formed in Cleveland, O. The product will include a four-passenger roadster at \$1250; five-passenger touring car at \$1250; five-passenger sedan at \$1850, and two-passenger roadster at \$1225.

INCREASE IN FISK CAPITAL RATIFIED.

The proposed increase in the capital of the Fisk Rubber Company from \$19,400,000 to \$39,500,000, has been ratified by the stockholders and an extension of

time granted for the conversion of the second preferred to common stock. By the new plan the conversion may take place at any time up to Nov. 1, 1932.

P. G. SEDLEY WITH EISEMANN MAGNETO COMPANY.

Parke G. Sedley, formerly New York branch manager of the Heinze Electric Company of Lowell, Mass., has joined the sales organization of the Eiseemann Magneto Company and will be stationed at the general office in Brooklyn, N. Y. During January he will go to Chicago, where he will have charge of the direct branch of the Eiseemann Company.

Wire Wheel Co. In United Motors.

**Houk Manufacturing Company Has Been
Acquired by Huge Organization
of Parts Manufacturers.**

The United Motors Corporation has acquired the Houk Manufacturing Company of Buffalo, N. Y., manufacturers of the well known type of wire wheel for automobiles. With the acquisition of this concern the United Motors now has control of nine of the largest manufacturing plants engaged in the production of automobile accessories and parts, all of which are leaders in their respective lines.

In taking over the Houk plant the same plan that has been followed in absorbing the other companies will be carried out. George W. Houk, founder of the company, will be the active head and the capacity of the plant will be greatly increased. An expenditure of \$1,000,000 on the plant will about double its capacity and work in connection with this plan has already been started. There have been 300 employees added to the pay roll, making a total of 800, and the capacity of the plant has been increased from 1000 wheels per day to 2200 since Nov. 1, while by Feb. 1 approximately 4500 wheels per day will be turned out.

The Houk concern commenced business in September, 1913, and in October of this year, the largest month in its history, 19,461 wheels were shipped and there were orders for 197,205 wheels on the books. Eighty-five different car manufacturers are represented on the company's books.

STUDEBAKER EARNINGS WERE \$8,140,420.

The net earnings of the Studebaker Corporation for the nine months ending Sept. 30 totaled \$8,140,420, as compared with \$7,082,479 for the corresponding period in 1915.

This year's profits were practically all derived from domestic business, the net earnings on the war business being \$154,000 as compared to \$3,140,000 on the foreign business last year.

New Chalmers Motor Corp.

**Old Chalmers Company to Be Succeeded
by New Corporation, Chartered
in New York.**

Articles of incorporation for the Chalmers Motor Corporation have been filed in Albany, N. Y. The new company is to succeed the Chalmers Motor Company. Under the refinancing plan the corporation has 600,000 shares of stock of no par value, of which 135,000 shares will be kept in the treasury, and 200,000 will be kept for exchange purposes. The money derived from the sale of 265,000 shares that is being offered will go into the treasury.

The present holders of common stock will receive four shares of the new stock for each share of the old and the preferred stockholders have an option of taking either \$115 per share for their stock or receiving 3½ shares of the new stock for each share of the old.

The directors of the new company are Benoni Lockwood, F. A. Gaynor and R. G. Goad of New York City.

OLYMPIAN MOTORS GETS OLD FLANDERS PLANT.

The Olympian Motors Company, Pontiac, Mich., has taken over the buildings constituting the plant of the old Flanders Manufacturing Company at Pontiac. The buildings were built especially for the manufacture of automobiles and are of modern fireproof construction of steel and brick. They are equipped with all conveniences, including electric hoist elevators and other apparatus to facilitate manufacturing operations.

MAY DEFER REORGANIZATION OF BEARING COMPANY.

Net earnings of \$747,546 reported by the Standard Roller Bearing Company for the fiscal year ending Sept. 30 may result in the abandonment of the plans for the reorganization of the concern. Issues of common and preferred shares to the total of \$11,298,600 are outstanding.

B. F. AVERY & SONS INCREASE CAPITAL.

B. F. Avery & Sons, tractor manufacturers of Louisville, Ky., will increase their capital stock from \$1,500,000 to \$2,300,000. Under the new refinancing plan the \$200,000 of seven per cent. series A preferred will be retired and an issue of \$700,000 series A1 seven per cent. preferred issued. A series of \$600,000 six per cent. preferred will also be put out and there will be 10,000 shares of common stock of a par value of \$100 a share. There is an issue of \$600,000 six per cent. preferred stock already outstanding.

Firestone Increase Is Authorized.

Stockholders Give Consent to Enlargement of Capital from \$4,000,000 to \$15,000,000

The stockholders of the Firestone Tire and Rubber Company, Akron, O., at a meeting held in the early part of the present month, authorized an increase in the capital stock of the company from \$4,000,000, the present capitalization, to \$15,000,000.

The new capitalization will consist of \$10,000,000 preferred and \$5,000,000 common stock. Only \$5,000,000 of the preferred will be issued at present and this amount has been underwritten by the Cleveland Trust Company at par.

The par value of the common stock will be reduced from \$100 to \$10 and the stockholders will receive 10 shares of new for each share now held, making an outstanding issue of \$3,000,000 of the common shares. The directors were also empowered to sell not more than 50,000 shares of the new common to employees of every grade at a price of \$100 per share, and also to set aside \$1,000,000 to provide an insurance fund, a pension fund and for other purposes making for the welfare of the employees.

FIVE MAKERS OF CARS ANNOUNCE PRICE INCREASES.

The Nordyke & Marmon Company, Indianapolis, Ind., announces an increase in the price of the Marmon 34 to become effective after Jan. 1, 1917. Nothing definite has been made known as to the amount of the advance, but the manufacturers say that it will be enough to cover the increasing cost of production, which has resulted from the higher costs of materials and high grade labor.

Rather than lower the quality of its product to meet the increased cost of material and high grade labor, the Kissel Motor Car Company, Hartford, Wis., has decided to raise the prices of the KisselKar Hundred Point Six models. The new prices take effect Dec. 1, 1916, and it is possible that in the near future another increase will have to be made. Just what the increase in either case is to be has not been announced by the Kissel company.

The Empire Automobile Company, Indianapolis, has announced that an advance in price of all models of the Empire car will become effective in the near future and that it will range from \$70 to \$100. The announcement states that while the date of the advance has not been definitely set, it must come within the next five or six weeks. The company has authorized all their dealers to guarantee present prices until Dec. 20.

The Packard Motor Car Company, Detroit, has announced a new price schedule which will go into effect on all orders for delivery after Feb. 1, 1917, and on deliveries before that date after the first 4500 cars of the new models have been sold.

An increase of \$185 on the "2-25," which is the smaller twin six, and an increase of \$235 on the "2-35" will then become effective, making the prices of those two models \$3050 and \$3500 respectively on all open cars.

The Cole Motor Car Company of Indianapolis, Ind., has announced an increase in price on the 1917 Cole models. The price of the eight-cylinder touring car and the roadster will be advanced \$100, making the price on these models \$1695 on and after Jan. 1, 1917.

An advance of \$200 in the price of the other Cole models is expected to become effective also after that date, although no definite announcement has been made by the company.

METZ COMPANY MAKES 100 CARS A DAY.

Production at the Metz factory in Waltham, Mass., has been placed on a schedule of 100 cars a day to meet the steadily increasing demand for these serviceable automobiles which are now the lowest priced, fully equipped machines sold in the world.

Sales Manager Roscoe A. Pickens, in speaking of the big boom in the demand for Metz cars since the price was reduced \$55, says:

"I expect this year will be the biggest in the history of the Metz company, and we are prepared to meet the demand, no matter how large it becomes. This new Metz model is a phenomenal mechanical creation, the result of the genius of Charles H. Metz. He built this new model a year ago for his own use. He tried it out. Made improvement after improvement and gave it to his engineers to take long trips in until every criticism was met and remedied and it suited him—suited Charles H. Metz. Nothing but the best would he permit to bear his name. That is why this 1917 car is considered such a wonder.

"But best of all is the success of Mr. Metz in making this latest model the real economy car. Repeated tests have shown 25 miles to the gallon of gasoline. Some of the cars have made more than 30 miles to the gallon, but we only claim 25 for it. Considering that after buying the machine the owner needs no further equipment, and that the price is only \$545, the Metz is the best dollar for dollar buy in the world and has the lowest upkeep cost."

REGAL MOTOR CAR PLANT NOT SOLD.

The Regal Motor Car Company's plant at Detroit has not been sold as was recently reported in a number of trade publications. In an announcement sent out by the Regal company it is stated that the story to the effect that the plant had been sold to the Fisher Body Corporation developed from the sale of one of its buildings that was of no use to the company. The Regal plant covers nine acres of floor space and the company's production this year will be between 7500 and 10,000 cars.

International Motors Plans.

Reorganization of Company Has Been Approved and \$1,500,000 Additional Capital Raised.

The plan for the reorganization of the International Motors Company, which was proposed last September, has been approved and additional capital of \$1,500,000 raised. The issue of \$2,881,000 of notes that was due this month have also been taken care of.

The securities of the new company will be exchanged on an equal basis for those of the old company. The new capital issues consist of \$4,381,000 seven per cent. cumulative first preferred stock, \$2,723,000 second preferred and 53,638 shares of common without par value. A portion of the first preferred is to be used to pay the \$2,881,000 in notes and the remainder will be offered to stockholders at par for cash to provide additional working capital.

The present holders of the \$3,600,000 preferred stock will receive 60 per cent. in new second preferred and 10 per cent. in new common. Ten per cent. in second preferred and 10 per cent. in new common will be exchanged for the outstanding \$5,628,000 common.

INCREASE IN HAYES WHEEL COMPANY CAPITAL.

The capital of the Hayes Wheel Company of Jackson, Mich., has been increased from \$1,000,000 to \$1,500,000. Additional machinery and equipment will be installed with the money raised by the new issue of capital and an increase will be made in the production of wire wheels.

CONTROL OF HESS-BRIGHT COMPANY REPORTED SOLD.

The report that the controlling interest in the Hess-Bright Manufacturing Company and the Conrad patent, which that concern controls, had been acquired by interests who direct the S. K. F. Ball Bearing Company of Hartford, Conn., has been denied by Hess-Bright Company.

The Conrad patent is the basic patent covering the operation of the annular type of bearing wherein the balls roll in a groove of a continuous surface. The Hess-Bright Company has granted licenses to several manufacturers to make these bearings under the Conrad patent, including the New Departure Manufacturing Company and the Standard Roller Bearing Company. The royalties derived from this patent are very large and have figured as one of the big assets of the Hess-Bright Company.

The Crow-Elkhart Motor Company, Elkhart, Ind., has been elected to membership in the National Automobile Chamber of Commerce and will have its models on exhibition at the national automobile show in New York in January.

**HAND SIGNAL LAMP.**

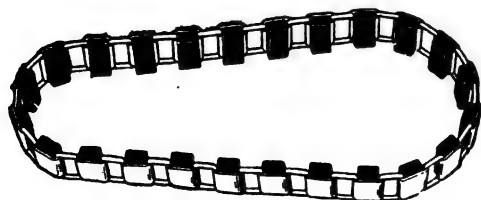
The Safety First hand signal is an effective signal at night. It consists of an electric lamp that is worn on the back of the hand, an elastic fitting around the hand, across the palm, holding it in place. Current is supplied from a socket on the dash through a fine silk cord to the lamp. So little current is required that it can be burned all the time. Since every driver almost instinctively extends his hand to indicate his intention to stop, slow down or turn a corner, this lamp on the back of the hand is a signal that nobody can fail to understand and heed. A two-candlepower bulb is used, enclosed in a polished nickel case, three inches in diameter and an inch thick. It is provided with a ruby bull's eye one inch in diameter and throws a strong red light. The bull's eye is surrounded by the words "Safety First," cut out in white. Besides being effective as a signal to traffic, it enables the driver to get the immediate attention of a traffic officer. This device is so light in weight that its presence on the back of the hand is scarcely noticeable.

Made by the Pittsburg Electric Specialties Company, Pittsburg, Penn. Price, \$2 each.

CROWE FAN BELT.

This belt is designed to replace the ordinary type furnished to drive the fan on Ford cars. It runs on the same pulleys as the flat leather belt, possessing twice the pull under the same tension and always driving the cooling fan at its maximum speed. It is constructed of genuine oak sole leather blocks, built into a high grade steel chain, which takes care of all pull. By a specially designed detachable link it is easily put on or taken off. No part is affected by oil, heat, water or dirt. Constructed on the famous caterpillar tread principle this belt will always cling to the pulleys no matter how oily or slippery they become, assuring positive means of driving the motor cooling fan.

Made by the Aniser Manufacturing Company, St. Joseph, Mo. Price, \$1.00.



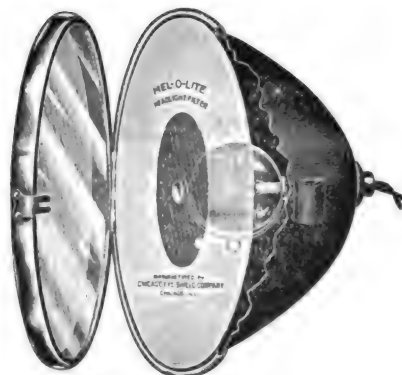
Crowe Fan Belt.



Hand Signal Lamp.



Waynelite Transformer.



Mel-O-Lite Light Filter.

MEL-O-LITE.

This is a device to remove the glare from electric headlights. Essentially it is a filter, breaking up the light rays in such a way as to eliminate the blinding and glaring effect, at the same time sacrificing none of the illuminating power. It consists of a frosted piece of pyralin attached to and covering the inside of the lens, with a piece of green or orange (optional) pyrolin, about 1 1/4 inches in diameter, fastened to the centre of the lens. Made to fit any headlight where electric lighting is used, it is inexpensive and serviceable and may be easily attached in one second. It may be had with plain frosted effect instead of the green or orange centre piece.

Made by the Chicago Eye Shield Company, Chicago, Ill. Prices, 50 cents to \$1.50 per pair.

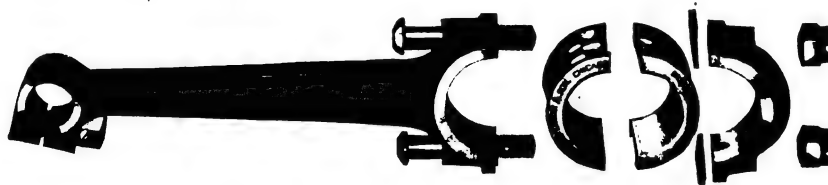
HYTORK BATTERY.

The claim for superiority of this new starting and lighting battery is based by the manufacturer on the plate used in it. It is built of the highest class of materials throughout. The grids are composed of antimonial pig lead, the same as any other lead pasted plate battery, but the secret of this battery lies in the composition of the "active material" that is pasted into the grids. Salesmen make a rather unique demonstration of this battery by taking one of the plates and bending it until the grid breaks without disturbing the "active material." This break down test is claimed to demonstrate the fact that inasmuch as all lead plate battery manufacturers are confined to the use of pig lead and antimony for their grids, this battery is as good as can be produced.

Made by the Heissler Storage Battery Company, Chicago, Ill. Prices upon application. Write for agency proposition, which is very interesting.

QUICK-CHANGE CONNECTING ROD.

The Ryerson quick-change bearing and connecting rod for Ford cars is designed for the purpose of allowing a bearing to



Ryerson Quick-Change Connecting Rod.

be installed without the necessity of overhauling the engine and to provide a bearing of the same type as in higher priced cars. The advantages claimed are ability to replace bearing without installing new connecting rod, provision of extra and inexpensive bearings that are easily carried in the car, time saved by being obliged to change bearings only, and unusual strength through the bearings being reinforced. The bearing itself is the Glyco skeleton construction, consisting of a strong reinforcement introduced into genuine babbitt. Special laminated shims are provided to be inserted, one on either side, where the halves of the connecting rod come together. They are composed of metal leaves, .002 of an inch thick, and can be peeled off when the bearings require adjustment. The connecting rod unit is made up of two forgings held together by cap screws and castellated nuts.

Manufactured by Joseph T. Ryerson & Son, 16th and Rockwell streets, Chicago. Write for prices and complete description.

THE WAYNELITE TRANSFORMER.

By the means of a specially designed transformer, called the Waynelite, it is now possible to equip the Ford so as to obtain a steady headlight illumination, which has heretofore been impossible owing to the fact that the current supplied by the magneto varies so with the motor speed. The Wayne transformer has been designed to overcome the failings of the electric lighting system of Ford cars. It steps up the current so that it will give the lamps a steady and bright light at slow magneto speeds and yet at the same time so hold back excessive current, such as at fast speeds, that there will be no danger of burning out the electric bulbs. It is made in a convenient shape and is oil and dust and water proof, making it possible to be installed anywhere about the car that is convenient. Little change is required in the wiring arrangement, although it is necessary to connect the headlights in parallel and use bulbs of lower voltage. This has an advantage in that should a lamp for any reason be disabled the other lamp will not necessarily be put out of commission also.

Made by the General Electric Company, Fort Wayne, Ind. Price upon application.

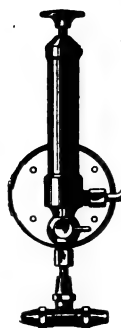
THE JIFFY STARTING PRIMER.

The Jiffy starting primer is an attachment whereby gas may be forced into the cylinders from the driver's seat with a minimum of inconvenience. The starter is located on the dash, or other place where handy, and is connected to the main gas tank or any place in the pipe line. It is also connected to the intake manifold, connection to both being by means of a small feed pipe. At the base

THE JIFFY STARTING PRIMER



Lawco Light Deflector.



Hytork Battery.

of the starter is a shut off cock for disconnecting from the gas supply. By pulling up a button at the top of the starter gas is drawn into the starter chamber. Pushing down on this button automatically stops the inflow of the gas and forces it under pressure to the intake manifold, where it is distributed evenly to each cylinder. As a means of securing easy starting and saving a heavy drain on the storage battery in an electric system, the device should prove of value. Especially interesting should it be to Ford owners whose cars are not equipped with pet cocks.

Made by the Jiffy Jack Company, 1104 Prospect avenue, Cleveland, O. Price, \$6.00.

THE LAWCO DEFLECTOR.

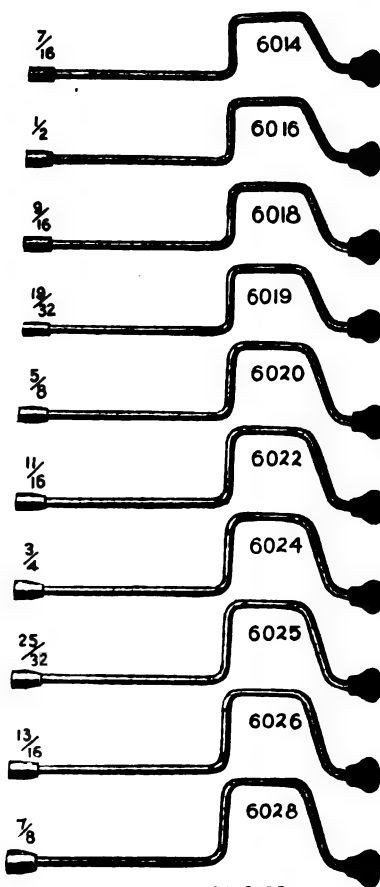
In this device the tip of the deflector dips downward, intercepting the upward rays at a point immediately in front of the focal point at which the extreme rays from the upper half reflector intersect those from the lower half. In addition to all rays that would naturally extend directly forward and those that would extend downward there are added by reflection from the inside of the deflector the rays that would otherwise rise upward. It is claimed that this arrangement assures full illumination on the road at normal focal distance from the driver's seat, with ample on the road immediately in front of the car and no glare. The Lawco deflector also serves to protect the glass from accident and from accumulations of snow, sleet or rain. An added feature of these deflectors is the setting of a "jewel" of red or green glass immediately above the tip of the shield. These are red on the left lamp and green on the right, serving as a guide to oncoming drivers.

Made by the F. H. Lawson Company, Cincinnati, O. Prices, \$2 to \$3.

WALDEN-WORCESTER WRENCHES.

Every car owner appreciates the value and convenience of special tools, and will consequently be interested in the new Walden-Worcester long shank brace socket speed wrenches. These tools are big time savers, especially when used on a series of the same sized nuts as on cylinders, and are considered indispensable in garages where they have been tried out. They can be used in almost any kind of work in connection with assembling and dismantling motor cars, and are very efficient, rugged and generally serviceable. To gain the most time in removing nuts the practise is to first start the nut with an offset socket and then speed it off with the brace or speed wrench. There is a size for every purpose, as is shown in our illustration.

Marketed by the Walden Manufacturing Company, 60 Commercial street, Worcester, Mass. Price of set of 10 wrenches, \$6; single wrenches, 65 cents each.



WALDEN - WORCESTER

SPEED WRENCHES

W-W Long Shank Brace Socket Speed Wrench Set.

SUGGESTIONS FOR THE FORD CAR OWNER.

How Tires Can Be Conserved and Operating Cost Reduced by Reasonable Care— Probable Causes of Deterioration and the Best Means of Restoration.

The 70th article dealing with the operation, construction, maintenance, care and repair of the model T Ford chassis is the 21st of the series devoted to adjustment, restoration and overhaul.

TIRE expense, which includes renewal and repair, is a considerable part of the cost of operating an automobile, and while wear is to be expected, this can be minimized with reasonable care and attention. The tires ordinarily used on the Ford chassis are 30 by three inches forward and 30 by 3½ inches (cross section) rear, and these may be plain or smooth tread or non-skid tread, a very general practise being to fit the rear wheels with casings that will best resist skidding.

Because of the very general knowledge of pneumatic tires obtaining from use for more than a quarter century with bicycles, horse vehicles and automobiles, there does not appear to be need of education of motorists as to principles or methods of construction, but there is every reason why they should know that they can obtain greater comfort, more pleasure and minimize cost by systematic observation and care.

The driver who has a formula for observation and, if need be, examination of his tires, will materially reduce expense, because he will note conditions that require attention, and comparatively little labor will greatly conserve the shoes. Probably no better care can be given than walking around the car whenever a stop is made, noting the condition of the tires with reference to area in contact with the road surface, and, if one is found to be reduced in pressure, which will be seen practically at a glance, it should be inflated to the required standard. With rare exceptions drivers refuse to inflate tires with hand pumps, and assume they can drive until they can reach a garage or service station where compressors supply compressed air for varying purposes.

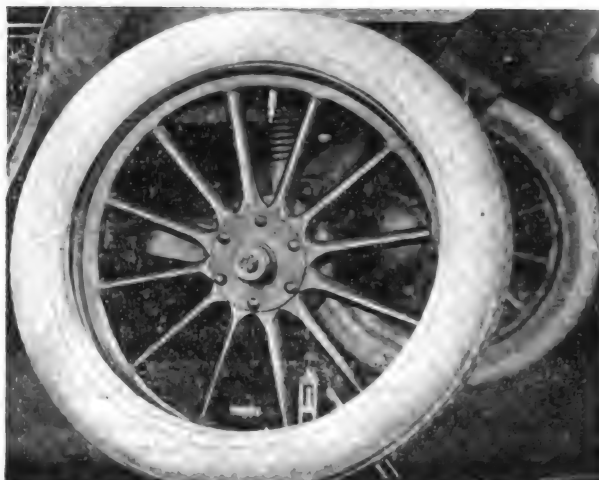
Soft Tires Are Vulnerable.

This belief might be justified if soft tires were not especially vulnerable, and there is far more probability of damage or destruction in driving even very short distances. The standard pressure for a Ford car tire is 60 pounds to the square inch and this should be maintained at all times. One of the most useful accessories that a motorist can carry is a pressure gauge. There is no particular choice that can be recommended other than to have what can be depended upon, and this should be used whenever a tire is inflated. One that can be connected to the pump or valve stem is best, for the tube need not be removed from the valve stem to test the pressure, and the

dial ought to be a size that can be read easily. This type can be carried with the gauge constantly connected with the pump and it is always convenient when wanted.

The hand pump used ought to be a first class tool and it should be as large as can be carried. This type will cost more than inferior pumps, but it will be well worth the money, for tire changes or repairs may be made at any time and in all weather conditions, and less labor will be necessary and it will endure as long as the car is used. There is no economy in a cheap pump. The smaller the pump the longer will be the time and more labor will be required to inflate a tire.

The tires for Ford chassis are practically the same in general design and construction. They will differ in quality and in mileage guaranteed.



Restoring a Tire to a Wheel: The Casing and Tube Placed on the Rim with the Valve Stem in the Hole Ready for Manipulation.

First class tires are the cheapest from every point of view. Tires not guaranteed are uncertain as to value, for one can understand that there is reason to believe that there is some good reason why the guarantee has not been continued. The unguaranteed tire may wear extremely well, but should it fail the purchaser must take his loss, and there is always the chance of failure.

Low Inflation Pressure Trouble.

One can accept the fact that at least 75 per cent. of all tire trouble results from low inflation pressure. By observing a tire on a car wheel one will note that as the weight on it is increased or the air pressure lessened the area in contact with the surface on which it stands becomes greater, the tire being more or less flattened along the circumference and the cross section becoming oval

as the side walls are deformed from the weight. As the wheel revolves this deformation obtains along the sides of the tire, every part of the wall area being subject to abnormal strain.

If the tire is not fully deflated there may be a leak, so that the pressure gradually reduces, and contact with road obstructions of any kind will so deform the tire that the rim will have nothing between it and the road save the tire structure, and then it is that the rim will continually ride on the tire and quickly cause what is known as a rim cut. This is practically destruction of the rubber external wall, and next the fabric will be worn. If the wear is continuous the tire may be so weakened that the air pressure will cause a rupture. Rim cut tires cannot be restored to anything like the original strength, no matter what the care, for the structure is more or less weakened the entire circumference. One can understand that a rim will very quickly wear a tire that is not well inflated.

When a pneumatic tire contacts with a road



The Inner Bead and Part of the Outer Bead Over the Outer Flange of a Clincher Rim—Springing the Shoe on with a Tire Iron.

obstruction the obstacle is partly forced into the surface of the tire, and this displaces a small volume of air so that the pressure is slightly increased over all the internal surface of the tire tube. If the tire is well inflated the obstacle is not forced into the tire to the same extent as when not well inflated. The resiliency of the air under the inflation pressure and the added pressure of the shock restores the tire to its normal form, and the walls are not constantly stressed as they are when partly deflated. If the blow is of great force and the shape of the obstacle is such that the wall or tread of the tire is very sharply bent the result may be breaking of the fabric, as one might break a piece of cloth that has been stiffened by an external coating.

What Causes a "Stone Bruise."

This form of rupture is what is known as a stone bruise, for the fabric, retained by the rub-

ber, cannot yield sufficiently and the plies will be cut, the threads usually breaking at the point of the most violent contact. In many instances a stone bruise will not be evident externally and when the tube is inflated to standard pressure the casing will be broken from within, this resulting in a "blow-out." Tires that have been damaged in this manner may endure for a short time, or for a few days, but the "blow-out" is inevitable, though few drivers can place the time or the cause of the original damage. Yet were the tire well inflated the bruise might not have happened.

Stone bruises may result from striking any obstacle, a cross walk, car rail, stone, piece of metal or anything that may be forced well into the body of the tire by the shock. If one examines a tire one will understand why the fabric may break when bent at a very sharp angle, although it will resist for any extremely long time stresses that can be distributed over the structure as they are intended to be distributed. A stone bruise is a damage that can only be repaired by an expert and usually restoration is by cutting a section from the tire and completely rebuilding that part. In the event that the bruise is small the structure can be cut away and a skillful workman can make a very good repair, but it will not be as dependable as the new section.

The only certain manner of determining the exact condition of a tire casing is removing it from the rim or wheel and examining the inside. Any actual damage to the fabric structure will be evident both to the eye and to the touch when the hand is passed over the internal surface, for breakage of the thread will always be unmistakably shown.

Rim cuts will be apparent from the outside as well as the inside, the wear on the fabric being manifested by enlarged and disintegrating threads. Repairs can be made by adding plies of fabric, but because of the constant flexing of the tire while in use unless the tire is strengthened completely from side to side it cannot be regarded as enduring.

The Construction of Tire Casings.

The reader should understand that the usual construction of tires is by consolidating from four to nine plies of fabric which are coated with a fine quality of rubber on one side (which coating is known as frictioning), with the edges formed about strips of more or less flexible rubber compound or wires or wire cable, so that they will have additional width and strength. The tires with the more flexible "beads" are known as the clincher types, which are stretched sufficiently to pass over the rims and which, when inflated, are retained on the rims by the pressure. The tires with the less flexible "beads" are the quick detachable types, which are retained by sectional rims that are locked by varying devices. The demountable tires are generally clincher

types on rims that are clamped or locked to the wheels.

When the tires are fully inflated the beads are firmly seated and are maintained in exact relation with the flanges or rings of the rims, but as the pressure in the tubes decreases there will be more or less movement of the beads against the rims and chafing or cutting, and rim cutting is usually close to the beads, where the tires are thinnest and there is the greatest flexing.

The tread of the tire is formed by a "cushion," which is a strip of rubber that is thickest in the centre and decreases in thickness to the beads, on which is usually placed a "breaker strip," which is one or more plies of fabric, on which is cemented the "tread," this being an external covering of rubber compound. The rubber compounds are "cured" by heating, which reduces them to a state of semi-fluidity, so that they are thoroughly consolidated with each other and the plies of fabric. The curing process is intended to bring the rubber compound to a condition that will have the greatest resistance to wear. The compound is thickest on the tread, which is expected to contact with the ground as the wheel revolves, but the sides for at least a quarter of the cross section diameter are never worn save from striking curbing, sides of ruts and possibly road obstructions.

How Tire Cuts Are Enlarged.

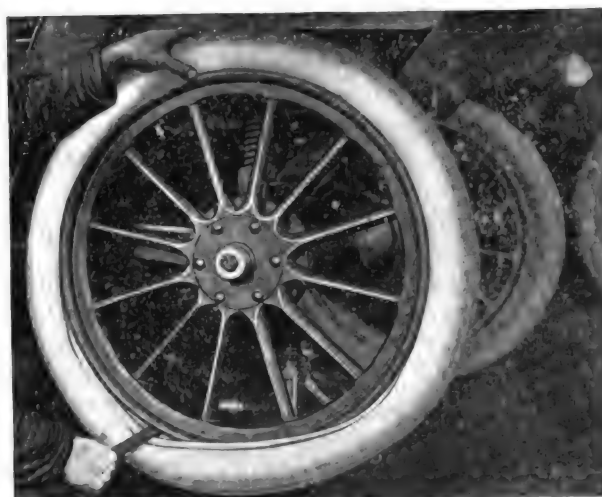
When the tread of the tire is cut the movement of the tire structure opens and closes the opening, so that it may and probably will take up and retain pieces of gravel or stone, sand, dirt and other particles. As the use is continued the cut will gradually extend, and when it is the depth of the compound the rubber will begin to separate from the fabric. This is caused by the fact that the rubber is compressed and deformed at the area in contact with the road surface, and in front of this, as the wheel revolves, a wave of rubber is formed that moves around the circumference 672 times every mile the machine is driven. This internal movement of the rubber compound is sometimes sufficient to generate a heat that will somewhat soften the surface of the tire and it will not have the same resistance or the resiliency as when cold. When the rubber softens and the fabric has been ruptured or weakened by a stone bruise the tire will burst from a "blow-out."

When sand or other matter accumulates in a cut in a shoe and the rubber begins to separate from the fabric what is known as a "sand blister" is formed, and if neglected water will reach the fabric and it will quickly deteriorate. This is another cause of "blow-outs." Sometimes stones, pieces of glass or metal will become imbedded in the rubber and will contact with the fabric. In a comparatively short time the fabric will be worn and weakened and rupture. Conditions of this character can only be found by frequent examin-

ations of the tires. During daylight cuts will usually be seen, but at night by passing the hands over the treads of the shoes cuts or other damage can be easily located, and means taken to protect them until repairs can be made.

Need of Repairing Surface Cuts.

Frequently small cuts that are apparently trifling are found. These are of no consequence if repaired promptly, but if neglected may cause the destruction of the tire. Any driver can repair these cuts by cleaning them thoroughly with a cloth wet with gasoline and filling the opening with plastic or semi-fluid gum. This should be done when the car is left for the day so that the gum will harden. A few hours later, or the following morning, if the surface of the gum is wet with acid it will harden almost instantly and will endure as long as the tire. Of course a more substantial repair can be done by vulcanizing, and any person can with an electric, steam or gasoline vulcanizer, make small repairs. Vulcanizing outfits, either acid or heating, can be purchased,



Forcing the Outer Bead on the Rim, Turning the Wheel as the Shoe Is Lifted Over the Flange with the Iron—But One Iron Was Used for This Work, the Tire Having Been "Limbered" by Other Handlings.

and by following the directions for use good restoration can be made. But if the damage is of considerable size it had best be taken to a tire repairer.

When a piece of the rubber is cut from the tire this can always be restored without difficulty by a repairer. Generally speaking a cut in the rubber is nothing to cause concern, but the wise driver will use a "boot" or "gaiter" that may be laced over the tire and used until the shoe can be removed.

(To Be Continued.)

Charles H. Heist of Sharpsburg, Penn., and Frank E. Bush of Pittsburg were killed on the Uniontown speedway while testing out their machine for the contests on Thanksgiving day. The machine was traveling at better than 60 miles an hour when the front axle broke.

(Continued from Page 12.)

the shipping port, New York City.

As a general statement, it is safe to say that nowhere in South America do automobiles run so rapidly as in Rio de Janeiro, and in few other cities are they as numerous. The many circular and gradually lengthening boulevards in and about the Brazilian capital prove ideal tracks. There is a speed limit, but it is rarely observed, the double driveways diminishing the danger of collisions, but of course not entirely preventing them.

In the section about Pernambuco no good roads are to be found, but during the last few years the city's motor cars have increased from 50 to nearly 300, a pleasing fact for the manufacturer to note and one that calls on the local officials for more activity in highway building.

From Sao Paulo southward and westward most of the smaller cities have their quotas of automobiles, and here and there one finds a big motor truck. In the small town of Uruguayana, in the extreme southwestern section of the state of Rio Grande do Sul, the stranger arriving by river boat is startled by the sounds of perhaps a score of automobile horns all blowing in unison; the noise is deafening, but none the less interesting to the new arrival, who of course places the town among progressive Brazilian centres of activity.

In 1913 this state spent nearly \$700,000 on the improvement of public roads; in 1914 over \$400,000 was devoted to similar purposes. Most of these roads were made in connection with Brazil's new colonies, which are being planted in more or less remote regions.

Those who have traveled inland by the railroad, starting at Almirante, in the northern part of the Republic of Panama, will recall the picturesque section through which the road passes. In this connection it is interesting to note that engineers have completed a survey for a highway from Almirante via Rovalo to Boquete. The route is about 75 miles long and the road will cross the backbone of the isthmus at 6000 feet above sea level. The new highway will be of standard macadam construction, with eight per cent. maximum gradient and a minimum curvature of a 20-meter radius. It will do for the northern section of the republic what the excellent roads are doing for the country from Panama City southward, opening virgin lands to commercial exploitation and drawing thousands of tourists in motor vehicles.

In returning to the United States the writer crossed Cuba by motor car, and at several places it was necessary to turn out of the road to allow the monster steam roller the right of way. This machine, typifying highway building activity, is the forerunner of the automobile; the former is literally "paving the way" for the latter. Cuba's new sugar crop of over 3,000,000 tons gives optimism to the planter, while many miles of excellent highways, and continued macadamizing activity, should not be overlooked by the motor car producer who seeks wider markets. In two years the Cubans bought from the United States 40 commercial

cars, valued at \$68,000. In the same length of time more than 1600 pleasure vehicles, worth \$750,000, were sold, besides \$100,000 worth of parts. About 90 per cent. of the cars in use in Cuba are of American manufacture.

At present it may be said that the market for motor cars in South America is promising rather than active, for the economic reason that he who buys must also be a seller. The average farmer or ranchman who proposes to use a motor vehicle is not likely to purchase one until his products are sold. When the leading ports of the South American continent are congested with raw products destined for foreign markets, as they are today, there is more or less inactivity with the farmer far back on the pampa. The dearth of ships therefore temporarily checks the ranchman from investment in a motor car.

These conditions, however, have other phases; and if steamers are not available for general cargo they are found for the purpose of transporting soldiers and horses to the battlefields of Europe. In the various seaports I watched with interest, if not emotion, the loading of splendid mounts aboard ships bound for the war zone. A large business in horses has developed, and still the demand on South America is for more ani-

mals. Even the depletion of the ranch in some sections is threatened. The shortage of horses has a tendency to popularize the substitute—the motor vehicle—and if the need is not seriously felt just now, the time is not far distant when increased sales of machines will be the inevitable result. The horse is being exchanged for the automobile.

South America has no Lincoln Highway, and it may be years before international co-operation creates a sentiment that might crystallize to construct one. The foreign traveler who takes his automobile to the countries of South America to make a long overland journey will be disappointed. No Glidden tours, as we know them in the United States, are advisable. But many miles of excellent roads are to be enjoyed by the motorist, and these are found in the great cities and leading out into their suburban developments, more especially about Buenos Aires, Rio de Janeiro, Montevideo and Santiago. One may motor from Argentina to Chile, but that tour is one of strenuous endeavor, only a few times accomplished. The common dirt roads of the pampas must for the present satisfy the automobile traveler, and he who attempts the mountain passes is sure to encounter dangers and difficulties.

MAGNITUDE OF AUTO INDUSTRY.

Figures Compiled by Elgin Company President Showing United States Leads the World.

A recent compilation of figures on the automobile industry of the world includes some figures that for magnitude almost stagger the imagination. Incidentally they show that the United States not only leads the world in this industry, but manufactures and owns more cars than all the other nations combined.

F. L. Brown, president of the Elgin Motor Car Corporation of Chicago, who recently had these figures worked out to show various phases of the industry, says that the fact that the average price of all American cars is shown to be \$1000 indicates unmistakably that this is the car for the average American family.

The figures in the compilation are as follows:

Motor cars registered in 47 of the world's leading countries, 3,108,468.

Motor cars now registered in the United States 2,500,000.

Value of cars owned in United States, \$2,500,000,000.

Average value per car, \$1000.

Number of cars to each mile of American highways, one.

Proportion of cars to United States area, one car to each 1 1/3 square miles.

Increase in real estate values due to

transportation by automobile, 100 to 400%.

Value of cars exported in 1915, \$100,000,000.

Public roads in the United States, 2,500,000 miles.

Annual new roads and improvement expenditures, \$300,000,000.

Motor car steel used in 1915, 670,000 tons.

Imitation leather used in 1915, 3,280,000 yards.

Top material used in 1915, 11,405,250 yards.

Hickory and other woods used in bodies, 1915, 8,450,850 board feet.

Hinges used in 1915, 4,893,560.

Additions to factories in 1915 total 11,000,000 square feet.

Cost of these additions, \$12,000,000.

Number of motor cars which made the trans-continental trip in 1915, 5000.

Number of men employed in the industry (approximately), 700,000.

In the United States there is one car to every 40 people.

In Iowa there is one car to every 19 inhabitants.

In Los Angeles there is one car to every eight inhabitants.

These statistics are based on reports up to June of this year and it is expected that if similar reports could be obtained at present all the figures would be increased enormously.

SATURATION POINT FAR OFF.

Studebaker Official Cites Statistics Showing There Still Is a Huge Field for Motor Cars.

That the point of saturation for selling automobiles is a long ways off is the belief of George L. Willman, assistant general sales and advertising manager of the Studebaker Corporation, and he has gathered some interesting figures and statistics to prove his contention, as follows:

"There is much discussion of reaching the 'point of saturation,' says Mr. Willman. At the present time there is in use possibly between 3,000,000 and 3,500,000 automobiles in the United States. Conservative statistics show that there are about 5,000,000 people in towns and cities who are yet possible prospects and can afford to buy automobiles of some sort. Out of the 3,500,000 motor cars in use, not more than 1,700,000 are in the hands of the pure farmer. There are 7,000,000 farmers in the United States, and you can count on half of them being able to own an automobile—possibly only a second-hand one. This indicates that we have not begun to approximate the point of saturation in this business today.

"There are about 25,000,000 horses and mules in the United States today. It takes five acres of ground, approximately, to feed a horse or mule per year. This, multiplied by the number of these animals, gives sufficient acreage to feed 125,000,000 people.

"There are about 12,000,000 people today taking care of these horses and mules, which includes the hostlers, liverymen, men engaged in the hay, grain and feed business, etc. The average horse or mule works about four and one-half hours per day and has about 20 hours idleness. Some farmers think they get a great deal more service out of these animals, but they will find that it is not true when they closely analyze their figures for the entire year. These figures mean the death knell of the horse and mule and one of the revolutionary changes that is coming about within a few years."

TECHNICAL PAPERS FOR S. A. E. WINTER MEETING.

The papers committee of the S. A. E., of which K. W. Zimmerschied is chairman, has practically completed arrangements for the subjects to be read at the winter meeting of the society, which will be held in New York Jan. 11, during the week of the national automobile show in that city.

Capt. Virginius E. Clark, U. S. A., is expected to present a paper on airplanes in relation to engines. A well known engineer will discuss engine designing for tractors, and a paper will probably be read with reference to the proposed military specifications now being considered

by the Truck Standards Division of the S. A. E. Standards Committee and a specially appointed board of the War Department.

Other subjects that will probably be taken up include pleasure car spring suspension, electrical equipment of gasoline cars, high speed automobile engines, dynamics of automobile crankshaft balancing.

Only brief digests of the papers will be given by the authors, allowing ample time for discussion of the subjects by the members.

WILLYS-OVERLAND COMPANY CONSERVES PAPER.

The Willys-Overland Company of Toledo, O., has sent out a notice to the effect that it has joined in the co-operative movement to conserve the supply of paper and relieve the shortage that is now felt throughout the United States. To accomplish this the company is reducing the length of publicity articles sent out by eliminating detail wherever possible and making all items brief.

GRANT SIX NEW CONVERTIBLE MODELS.

Two new convertible types, a five-passenger touring sedan and a three-passenger enclosed roadster, have been brought out by the Grant Motor Car Corporation, Findlay, O., in both of which

cars are incorporated the very latest ideas in interior trimming, lighting and ventilating. The coach work is described as of the very best. All the windows and doors are easily put in and removed, making it possible to change the car in a moment from an enclosed type to an open. On the underside of the top there is a high grade electric dome light with frosted cut glass rosette. An Edison socket is fitted in the dome so that the bulb cannot work loose, and it is wired so that it can be attached immediately to the electrical system of the car.

MCFARLAN MOTOR COMPANY ADVANCES PRICES.

All models of McFarlan cars, manufactured by the McFarlan Motor Company of Connersville, Ind., have been advanced \$300 in price. The increased cost of both labor and materials has compelled the company to advance its prices as have most all other makers of automobiles. The touring car and companion models on the new list are \$3500 and the prices on closed work bodies range from \$4600 to \$5300.

MAKER OFFERS REWARD FOR STOLEN AUTOMOBILE.

Following the theft of the Pathfinder touring car owned by W. E. Stalnaker, vice president of the Pathfinder Company of Indianapolis, Ind., he offered a reward of \$500 for information that would lead to the arrest and conviction of the person who stole the car.

Going further with the offer, Mr. Stalnaker said, "we are willing to contribute the amount of \$500 for information that will lead to the arrest and conviction of any person or persons for stealing any Pathfinder car in Marion county, Indiana, at any time during the next six months."



This is the Complete Hospital Opened Recently by the National Motor Vehicle Company in Connection with the National Safety First Campaign. The Hospital is in Charge of a Trained Attendant and is Equipped with All the Latest Medical and Surgical Devices.

MOTOR STARTING AND CAR LIGHTING.

Lamp Circuits That Are in Common Use in Lighting Systems—Locating Wiring Failures, Learning Conditions, Following Circuit Breaks—Polarity of Terminals.

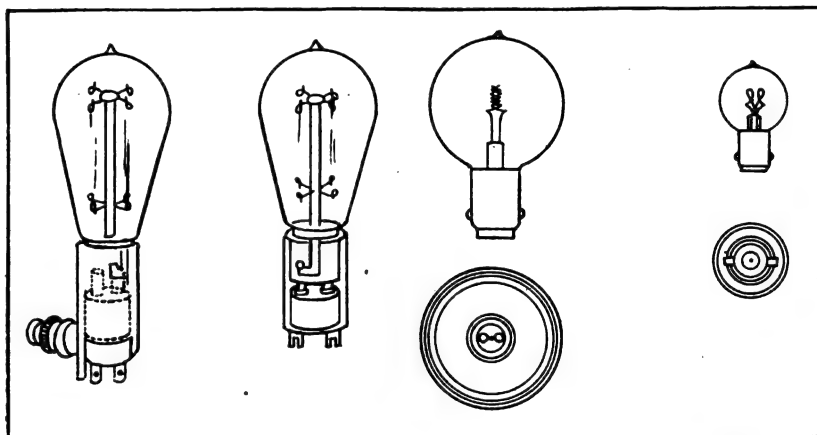
THE most frequent manner of installing lamps is in parallel or multiple with the battery, which means that there is one wire from the battery carrying the positive current, and each lamp is connected to it. There may be another wire carrying the negative current from the lamps, or, if a single wire system, there may be wire leads from the negative or positive side of the lamps to the ground. The lamps may be located anywhere along the main line, each receiving the full voltage of the battery or generator.

When lamps are in series the circuit passes through them, from one to the other, so that the combined voltage of the lamps is the voltage of the circuit. That is, a 12-volt circuit would have two six-volt, three four-volt, four three-volt, six two-volt or 12 one-volt lamps. This system has the disadvantage that in the event of the failure

different lights and there will be wires from one side of the lamp socket to the ground, which probably will be some part of the frame of the machine. If the system is double wire there will be a connection from either side of the lamp sockets to the main circuit. In the event that the system is three wire there may be connections from the positive side of the battery to the negative or to the neutral wire. There will be similar connections from other components, in some cases with a single wire system there may be numerous grounds.

Where there is a connection, either permanent or removable, there is of course a possibility of it becoming loose or broken, and wires may break or the insulation may chafe so that they will contact with other metal, or the insulation may, because of saturation with water or lubricant, become a conductor and the current may be obstructed or may escape between the terminals.

Where there is a lamp in the circuit its failure is evident, but where there is no lamp then the condition must be learned. This can be done by testing with the battery or lighting circuit tester that has been described. In making the test a wire should be located and followed from end to end. By touching the ends of the wire leads of the tester to the ends of the wires of the system each can be tested, for if the wire is intact the lamp of the tester will



Different Forms of Electric Lamps Generally Used in the Lighting Systems in Conventional Use—The Bayonet Base at Left; the Relative Proportions of the Regular and Candelabra Bases.

of one lamp or one connection all lamps of the circuit would be extinguished, while with the multiple circuit there would be the loss of the light that failed and the others would continue to burn. There are, however, combinations of multiple and series lamp circuits, because the loss of one lamp may be a signal of a needed repair, as the connection of the tail and speedometer lamps in series to indicate to the driver by the failure of the speedometer lamp that the tail lamp has failed. The combinations are by no means standard, the wiring being to meet the particular demands of the machine in which they are installed.

Locating Wiring Failures.

As has been stated, if the lighting system be a single wire this may have the negative or the positive side grounded, but generally there will be a positive wire leading from the battery to the

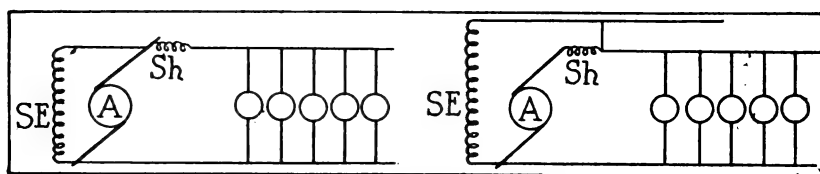
be lighted. If the lamp will not burn there is an obstruction that may be either a broken wire or defective insulation. If the wire is broken it may be spliced or replaced entirely, but it should be tested between the ends and the point where the defect has been found to insure that there is no other obstruction before splicing is done.

Condition of Wire Leads.

If the wire is found intact between the points of the tester then the condition of the terminals should be learned, because the circuit may not be complete unless the connection is tight, and corrosion may be as effective an obstruction as a broken wire. After cleaning the terminals and being certain that they are tight the circuit ought to be complete. In making tests each wire of the system ought to be tested first to be sure that it is intact or defective, and after repairing,

if this is necessary, by renewing the wire, by splicing, by covering chafed insulation with tape, by soldering or making new terminal connec-

is designed to reach. Where the insulation has been broken from chafing or cutting, or at the ends of the wires, are probable places for short circuits. Tests can be made of circuits in which there are fuses by placing lamps between the clips that hold the fuses, the lighting of the lamp being indication of a short circuit or a grounded wire. Fuses are not general in single wire systems,



Diagrams of Compound Wound Generators, That at Left Being a Short-Shunt and That at Right a Long Shunt.

tions, by cleaning the terminal studs and terminals, the circuit between the terminals of the wiring may be tested. The worker should not attempt to make tests with the wiring on the terminals, for one end at least should be removed so that there will be no possibility of the current of the tester escaping through another outlet.

If there are several wires attached to a common terminal, or the terminals are so close that connection may be made with one wire on more than one, there should be means of identification placed on the wiring and the terminal to which it should be attached, so that replacement in the exact relation is practical. If there are a number of connections at one point and the wires lead to other points, the individual wires can be identified by the use of the tester leads, touching one after another until the right wire is found. When a wire is once known it should be marked so that it can always be located in future.

Following Circuit Breaks.

In the above statements there has been assumption that the wiring is unbroken, but there may be instances where no flow of current will be shown between a wire terminal and the terminals of other wiring when the tester is used. In such event each individual wire must be located and followed, and when tests of each have been made those that are defective can be identified. Where a wire does not show "life" when tested at the terminals, one end at least being removed from the terminal, test should then be made by touching one of the tester terminals on the metal parts with which the wire contacts, following the wire from end to end, and all of the terminals of other wiring. Should the lamp of the tester be lighted during this test there may be either a ground, a short circuit or broken insulation.

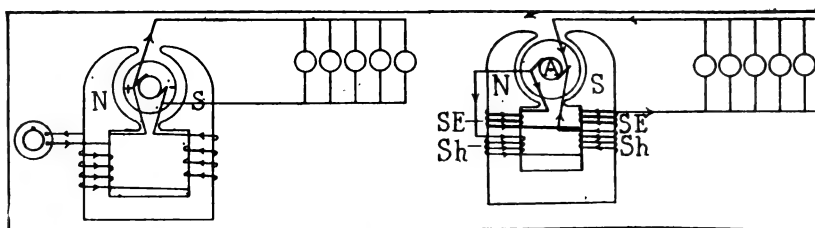
The ground results from a wire contacting with another metal part between the defined terminals so that the current flows from the ground back to the battery or generator or to other wires or parts without completing the circuit through which it should flow. A short circuit is established when two wires contact and the current can return through the second wire without reaching the lamp or other equipment it

but they are commonly used in two and three-wire systems.

The Polarity of the Terminals.

As has been stated there are terminals on which the connection of the right polarity must be made, and some of these are marked so there should be no mistake in identification. If there is doubt as to which lead is positive and which is negative the previously described test may be used. There are connections, however, where the wires may be connected without reference to polarity, and these are the starting switch and starting motor, the knife, push button and snap switches, the lamps and the lamp sockets. The positive terminal of the generator must be connected with the positive terminal of the battery and the negative terminal of the generator with the negative terminal of the battery.

All systems do not include ammeters, which are especially desirable, for they will indicate whether or not the generator is charging and whether there is discharge from the battery. The ammeter should be a "zero centre" instrument, that is, the pointer should be in the centre when it is not indicating, and it should swing toward one side when the battery is being charged and toward the other when the battery is being discharged. To illustrate, when the engine is charging without lights the ammeter ought to show the maximum indication, and with lights but a very slight degree of charging, for the lamps will require about the current production of the generator. If the engine is idling slowly with the lamps lighted there will probably be discharge indicated, for the maximum current production will not be reached. With the lamps lighted and



The Wiring Principles of Generators: At Left, a Simple Shunt Machine on a Lighting Circuit; at Right, a Compound Generator; Se Indicating the Series Coils and Sh the Shunt.

the engine stopped there will be approximately maximum discharge.

(To Be Continued.)



Overland Cars Equipped for Ambulance Service as They Were About to Leave Australia for the Egyptian Front.

GERMANY'S ACCIDENT RECORDS.

Comparison of Accidents in Germany and New York Show Remarkable Parallels.

Records maintained in New York and in Germany almost coincide as to the cause of the large number of fatalities on the streets.

The Association of Administration of German Street and Interurban lines reports that 86 per cent. of all fatal and serious street car accidents that occurred in Germany in 1915 were due to the fault of the injured. The report of the New York City police for the same period shows that 87 per cent. of all vehicular accidents in the streets of that city, in which persons were either injured or killed, were the fault of the injured.

The German report shows that about one-half of all those killed were children, while the New York report shows that one-third of those killed or injured were under 16 years of age.

Authorities on traffic regulation say that these figures prove that the most efficient method of reducing the fatalities from traffic accidents is to educate the pedestrians to exercise more care and caution in crossing thoroughfares or streets.

AUSTRALIAN CONTINGENT OF OVERLANDS IN EGYPT.

The Willys-Overland factory recently received a very interesting letter from Murray Aunger, Ltd., the Overland dealer at Adelaide, Australia, telling of the service of the Overland cars supplied to the Australian Motor Transport Service station at Gamrah, Cairo, Egypt.

The writer states that the Overlands have been running continuously ever since they have been in Egypt and that "Up to a short time ago there was no speed limit in Cairo, and we used to drive

the cars at a tremendous rate. When we were stationed at Heliopolis, about five miles from Cairo, we would have races into Cairo. It was no uncommon sight to see 15 or 20 ambulances tearing along the main road to the city.

"But now we have a speed limit, which is being tightened almost fortnightly. The best run we now have is to a place called Helousan, about 25 miles from Cairo. The road follows along the banks of the River Nile practically the entire way.

"One soon picks up the Arabic language, especially enough of it for motoring purposes. Such essentials as "Im-shi," go away; "Yeemonak," get over to the right; "Shamlak," get over to the left; "Oak," look out; "Oak rigglak," look out for your feet, are enough for an ambulance driver's practical purpose."

SPECIAL AUTO TOURISTS TRAINS IN FEBRUARY.

The special trains that will carry automobilists and their cars to California, as provided for by the Tourists' Association of Central California, will leave New York on Feb. 24 and Chicago on the 28th.

Arrangements for special rates in carrying the automobiles across the country have been made by the association with the view to stimulating interest in touring in Central California during the period when weather conditions are the most auspicious in which to enjoy the beauty and wonders of that section of the country.

Information as to the details of arrangements can be secured from the fol-

lowing offices: The Hotel McAlpin, New York City; 900 Lytton building, Chicago; 517 So. Spring street, Los Angeles, Cal., or from the main offices in the Claus Spreckels building, 703 Market street, San Francisco, Cal.

BOSTON COMMISSIONERS DECIDE ON STANDARDS.

The street commissioners of Boston have decided upon the use of iron standards at the street crossings as a means of directing traffic in the main thoroughfares. These standards, which are designed to take the place of policemen at dangerous crossings, are being placed in different locations by the police department.

WILL DISCUSS HIGHWAY ENGINEERING EDUCATION.

A national conference to discuss the subject of highway engineering instruction in the civil engineering curricula of universities and colleges, will be held in the assembly hall of the Automobile Club of America in New York City on Dec. 29 at 8:30 p. m.

The convention is being held under the joint auspices of the Promotion of Engineering Education Society, the American Association for the Advancement of Science, the National Automobile Chamber of Commerce, the Automobile Club of America and the National Highway Association.

Arthur H. Blanchard, C. E., professor of highway engineering at Columbia University, and secretary of Section D, Engineering, of the American Association for the Advancement of Science, conceived the idea of the convention and it was through his efforts that the meeting has been made possible.

SIOUX CITY, IOWA, AUTOMOBILE SHOW.

The Sioux City Automobile show to be held in that city by the Sioux City Automobile Dealers' Trade Association, will be practically twice the size of last year's display. To provide for the large increase in the number of cars to be exhibited the association is having an annex built onto the auditorium where the show has been held in past years. The exhibition will be held during the week of Feb. 13-17 inclusive.

WENT THREE MILES WITHOUT GASOLINE.

Abner Doble of the General Engineering Company, Detroit, has for the last three years been driving a steam car that is similar in design to those being built for the New York show. This car, he says, is capable of running two or three miles after the fuel is exhausted.

The normal pressure in the generator, when the car is on the road, is 600 pounds. Seventy-five pounds, however,

will propel the car, and it will run between three and four miles on a smooth, level road, before the 600 pounds pressure will be reduced to 75.

"Running on the pressure already generated is sometimes a great convenience," said Mr. Doble. "Like everyone else, I sometimes run out of fuel when on the road, but I discover it because my power gauge begins to drop, while gas car drivers find it out when the car stops and cannot be persuaded to continue."

This is due to the reserved energy stored in its steam generator when the car is running.

ANNUAL MEETING OF LINCOLN HIGHWAY ASS'N.

The annual meeting of the directors of the Lincoln Highway Association, held recently at Indianapolis, brought together many of the well known leaders in the automobile industry of the country.

The directors attending were: Henry B. Joy, chairman of the board of directors of the Packard Motor Car Company; Carl G. Fisher, president of the Prest-O-Light Company and president of the Indianapolis Speedway; Roy D. Chapin, president, the Hudson Motor Car Company; John N. Willys, president, the Willys-Overland Company; A. Y. Gowan, vice president, the Lehigh Portland Cement Company; Emory W. Clark, president, the First and Old Detroit National bank; F. A. Sieberling, president, the Goodyear Tire and Rubber Company; Paul H. Deming, vice president, American State bank; S. D. Waldon, H. C. Ostermann, field secretary, and A. F. Bement, secretary.

S. D. Waldon and James A. Allison of Indianapolis were unanimously elected to the board of directors.

The old officers of the association were re-elected to continue through the coming year. They are: President, Henry B. Joy; vice presidents, Roy D. Chapin, Carl G. Fisher; treasurer, Emory W. Clark, and secretary, A. F. Bement.

"WOLVERINE EIGHT" JACKSON'S LATEST.

The "Wolverine Eight," the latest model of the Jackson Automobile Company of Jackson, Mich., is, according to the manufacturers, the finest and most perfectly developed car ever turned out by Jackson in its 15 years of successful automobile building.

It is a five-passenger, light weight car of medium price with a V type, valve-in-the-head motor, which is said to give an average of better than 17 miles to a gallon of gasoline. The A. L. A. M. rating of the motor is 28.8 horsepower in factory tests it has shown at 2400 revolutions per minute. It is fitted with a Zenith carburetor of the "twin jet" type, and Remy ignition system. The stock equipment includes practically all the latest motor devices and accessories that have come into vogue in the past year or so.



Sand Blasting Car Parts in Cadillac Motor Car Plant, the View at Left Showing Interior of Cabinet and at the Right, the Exterior.

CALIFORNIA APPROVES BONDS.

\$15,000,000 Issue Approved at Election Insures Extensive Road Building.

The bond issue of \$15,000,000 for the completion of the state highways system in California was overwhelmingly approved by the voters of that state on election day. This sum will insure the paving of approximately 1000 miles of road in addition to the 1122 miles already finished at an expense of \$16,000,000.

In addition to this sum the state has \$250,000 available from the federal aid appropriations. One new highway will run north from Los Angeles into the famed Sequoia forests, and it is expected to surpass all the other highways in scenic beauty. It will terminate among the famous big trees which are said to be the oldest living things in the world.

Initial work will also be done on the trunk lines extending from San Diego to the northern boundary of the state.

CLEVELAND TO HAVE FIRST ACCESSORY SHOW.

Probably the first exclusive motor car accessory show ever held in this country or elsewhere will be opened during the first week of January at the Dreamland Auditorium in Cleveland, O.

The Auto Show Accessory Company is conducting the show and W. B. Davis of the M. & M. Company, 515 Huron road, Cleveland, O., is handling the space, which is divided into three classes, grades A, B and C. Spaces will be allotted in the order of receipt of applications. The exhibition has been approved by Commissioner William M. Webster of the N. A. A. A. J., and it is understood

that a number of manufacturers have given it their indorsement.

All the space will be devoted to the display of accessories and no cars will be shown. This idea is the result of the belief that has been quite general among both manufacturers of accessories and jobbers that their lines when exhibited alongside of hundreds of cars did not get a fair share of the attention or that the proper time would be devoted to their inspection to secure the interests of purchasers.

WINTON COMPANY WILL CONTINUE SAME MODELS.

The Winton Company, Cleveland, O., will continue its present models, the Winton 33 at \$2485, and the model 48 at \$3500.

"The only change we contemplate," says General Manager Churchill, "is to increase the price of either or both models without notice, and we may be forced to announce an increase at any hour. Yearly models died as a natural consequence of perfected manufacture. I mean that our cars are made to endure, not to be discarded after one year's use. We want our buyers to get plus value, and our system keeps Winton Six cars in esteem, irrespective of their age."

The Chicago Automobile Trade Association will hold a used car show at the Chicago Coliseum during the week of May 8-14 next year. The exhibitors will draw for space, which will be sold at 40 cents a square foot.

HOTEL LENOX

North St., at Delaware Avenue, Buffalo, N. Y.

A modern, fireproof and distinctive hotel of 250 all outside rooms. Ideally located. Excels in equipment, cuisine and service.

Operated on the
European Plan

**\$1.50 per Day
and Up**

C. A. MINER,
Managing Director

Write for complimentary
"Guide of Buffalo and
Niagara Falls"

"Far from a Big City's Noise,
Close to a Big City's Business!"



NOTICE TO READERS.

THIS department contains the Mechanical Editor's answers to readers' inquiries. It is open to every subscriber. If any part of your car is not operating satisfactorily, or if you desire information regarding operating, maintaining or repairing motor cars, do not hesitate to lay your troubles before him. He will answer promptly and fully, either by mail or in these columns, as you direct. This service is free to every subscriber, and is often the means of saving considerable money that otherwise would be spent with a garage man. Letters should always be signed with the writer's full name and address, and the car or part in question should be properly identified, by mentioning the maker's name, model, year of production or other distinguishing feature. Address all inquiries to the Mechanical Editor.

PRACTICAL TESTS FOR GASOLINE.

(W. W. L., Middletown, Conn.)

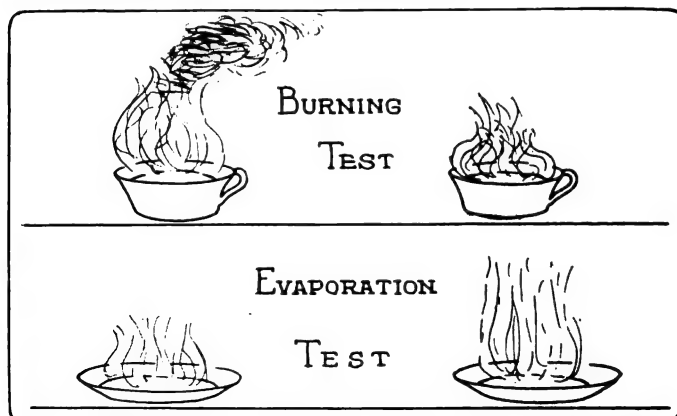
I have heard so much about poor quality gasoline and oil now being sold by car dealers, etc., that I am curious about how to test them. Will you advise the simplest and best ways I can do it, remembering that I have no special apparatus of any kind for the purpose.

Most of the reputable oil companies will disclose the laboratory test figures of their lubricants if the buyer insists on having them, and, in the case of the standard brands, the figures are dependable. The figures given usually are the following: Gravity, flash point, fire test and viscosity. The companies have other test figures, some of which are of interest to the user. Viscosity at 212°, cold test, per cent. of acid, per cent. of coke residuum.

In comparing various oils the figures which should receive most consideration are the viscosity at 212°, the gravity and the amount of carbon, or "coke" residue. Some of the cheaper oils show fairly good viscosity at ordinary temperatures but, when subjected to heat, become almost useless as a lubricant.

Gravity, while it has nothing to do with lubricating qualities, is an index of the purity of an oil, as well as of its origin, the oils from the eastern fields having a paraffin base, being lighter and, generally, better lubricants than the products of the southern and western fields, having asphaltum base. The "coke" test is also an indication of the purity of an oil, although it does not necessarily indicate the tendency of the oil to leave deposits in an engine.

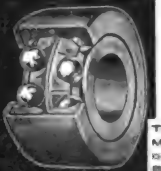
To roughly determine the relative merits of several kinds of oil, the following procedure is suggested:



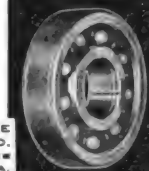
Two Ways of Testing Gasoline to Determine Quality.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

NEW DEPARTURE BALL BEARINGS



American Made
FOR
American Trade
QUALITY
FIRST



THE NEW DEPARTURE
MANUFACTURING CO.
CONRAD PATENT LICENSEES
BRISTOL, CONN., U.S.A.



WONDER-MUST

THE ORIGINAL
SPRAYER POLISH

You can get it anywhere.

Regal-4-thirty-two

THE BIGGEST CAR IN THE LIGHTWEIGHT CLASS

\$695

REGAL MOTOR CAR CO. - DETROIT, MICHIGAN

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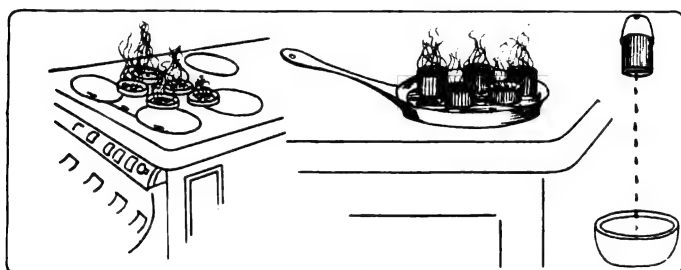
Allen

\$795
r.o.b. factory

MOTOR CARS
THE ALLEN MOTOR CO. FOSTORIA, O.

Procure as many covers of baking powder or coffee cans as there are samples to be compared. Put about two tablespoonfuls of each oil in each of these lids and place them on a hot stove. If the receptacles containing the samples are numbered for identification, the small tins may also be conveniently numbered by placing in them short pieces of wire, shot or small pebbles to the number equal to that of the respective samples. The lids should be placed closely adjacent, to insure uniform heating. As soon as one of the heated samples begins to give off smoky vapor it should be removed and placed to one side, and so on with the next, placing them in consecutive arrangement. The one standing the longest heat will have the highest flash test, the relative values of the others being in the inverse order of their removal from the stove.

Partly fill a number of small tins of the same kind and size with the different samples. Place these in a saucepan large enough to accommodate them and partly fill with hot water, the level of which should be somewhat below the tops of the tins, which should be covered. Place on the stove and bring the water to a boil. Allow it to boil for some time (the saucepan may be covered) as oil absorbs heat slowly. Prepare another tin by drilling or punching a small hole through its bottom, say about 1/16" or 3/32" in diameter. After the oil in the tins has become heated to the boiling point of the water, empty the contents of one of the tins in the improvised "viscosimeter" and carefully note the time taken for the oil to pass through the small hole. The other samples should



At Top, Method of Testing Oils for Presence of Acids; at Bottom, Testing for Flash Point and Viscosity.

be kept on the stove in the meantime, and tested in turn, the elapsed time of each percolation being jotted down for later comparison. It is essential that the quantity of each sample be exactly the same, and that the top of the perforated can be uncovered. The sample requiring the most time to pass through is the best.

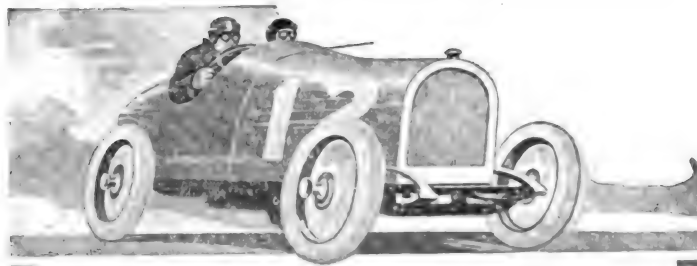
A hydrometer is the most convenient means of making this test. If a regular oil hydrometer is not available a gasoline hydrometer may be used, these being quite common. The sample in which the instrument floats the lowest is the lightest and the best.

Place equal parts of oil and clean water in a bottle, having a bottle for each sample and filling them approximately half full. Each bottle should be given a vigorous shaking for 15 or 20 minutes and then allowed to stand for 24 hours. Oils free from acid will entirely separate from the water, which will be clean, while those containing acid will remain partly emulsified and present a cloudy appearance. Instead of shaking the mixtures of oil and water may be agitated with an egg beater, and then placed in the bottles or in glasses.

It will often be found that no one sample shows superiority in all tests, but it is safe to assume that the one which stands nearest to the top of the list, in the several tests, will give the best results.

In testing two or more samples of gasoline probably the simplest method would be to place a given quantity of each

(When Writing to Advertisers, Please Mention The Automobile Journal.)



Faster! Faster! Faster!

Speed—power—they call for perfect ignition—a spark so flashing, burning hot that the mixture doesn't matter. Richest mixture to leanest, you'll get a full explosion every time if you have an

EISEMANN

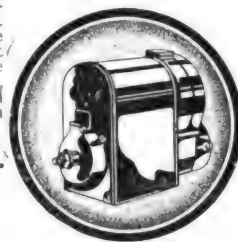
MAGNETO

Just as good at lower speeds, too. Even when your motor is barely turning over, the Eise-mann spark is hot and powerful. EISEMANN MAGNETOS are so dependable and efficient that 108 manufacturers of Pleasure Cars, Trucks, Tractors, etc., have adopted them as standard equipment. That should mean something to you!

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REG U. S. PATENT OFFICE

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You Have Tried the Rest
Now Get the Best

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Friction, in spite of oil and grease, takes the life out of bearings and gears. But—

DIXON'S
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Automobile
LUBRICANTS

turn friction into fiction.

The right Dixon lubricant for each part means increased power, mileage, safety. Ask for booklet No. 210 G.

JOSEPH DIXON CRUCIBLE CO.,

Established 1827

JERSEY CITY, N. J.

BRISCOE

"A line of three leaders."

Briscoe Twenty-four, \$625, electric starting and lighting; full equipment.
Briscoe De Luxe Eight 38 \$965; Four 38 \$785.

Write or wire.

BRISCOE MOTOR CORPORATION, 157 Leroy Ave., Jackson, Mich.



YOUR CAR ANY CAR

No matter how hot the weather, no matter what the speed or running conditions.

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The Standard Oil for All Motors
Keeps Cars Running Right

Polarine is the temperature-tested, friction-proof motor lubricant. Motor construction is now so standardized that Polarine will lubricate any engine correctly, economically—all the time. Sold everywhere. Look for the SOCONY sign on garages. It is the sign of quality.

Standard Oil Co. of New York

Principal Offices
NEW YORK BUFFALO ALBANY BOSTON

in a shallow plate, and place these in the sun, or where a draught of air will assist evaporation. The plates should be of the same size and shape, and should be placed out of doors and safely distant from any exposed flame. An idea of the comparative volatility of the samples can be obtained in this way.

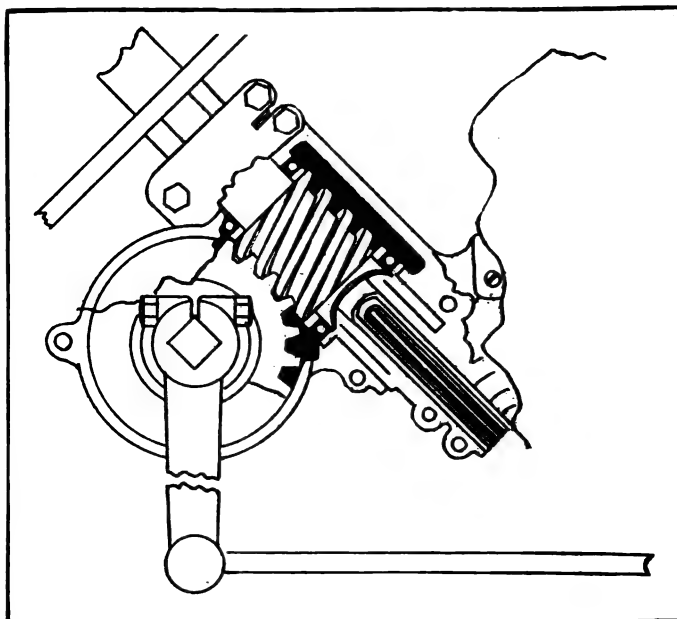
A somewhat similar test, occupying less time, may be made by placing equal quantities in cups of the same size and igniting the samples. The one burning out most quickly, giving off the least black smoke and leaving the least deposit in the cup, is the best. In observing the residue it should be noted that a precipitation of dry soot in the cup is less objectionable than a deposit of a soft, gummy nature.

IRREVERSIBLE STEERING GEAR TYPE.

(I. B. H., Syracuse, N. Y.)

I have just received my first automobile and, of course, am quite "green" about its mechanism. When the salesman of the ——— company was selling the car to me he spoke of the importance of the irreversible steering gear with which the machine is equipped. I have forgotten much of what he said, but remember that he was very earnest about it. Will you explain what the irreversible gear is and why it is the best?

With the introduction of the irreversible steering gear type there came into automobile practise a greatly increased



Illustrating the Irreversible Type of Steering Gear Used on a Popular Priced Car.

measure of safety in driving. The chief feature of this type is that when the front wheels strike obstructions that ordinarily would tend to deflect their straight ahead course and wrench the arms of the driver, the gear holds the wheels steady; that is why the term irreversible was aptly applied to it. The principle of construction of the irreversible type does not vary greatly from the other type, the difference being in the employment of a worm gear on the steering shaft that engages with a toothed wheel to which the steering arm is attached. This is explained in the accompanying sketch. With this type of gear installed there can be no backlash from the front wheels and consequently it relieves the driver of the necessity of keeping a firm grip on the steering wheel at all times, which is a considerable saving in nervous energy.

FIRING ORDER OF COLE EIGHT.

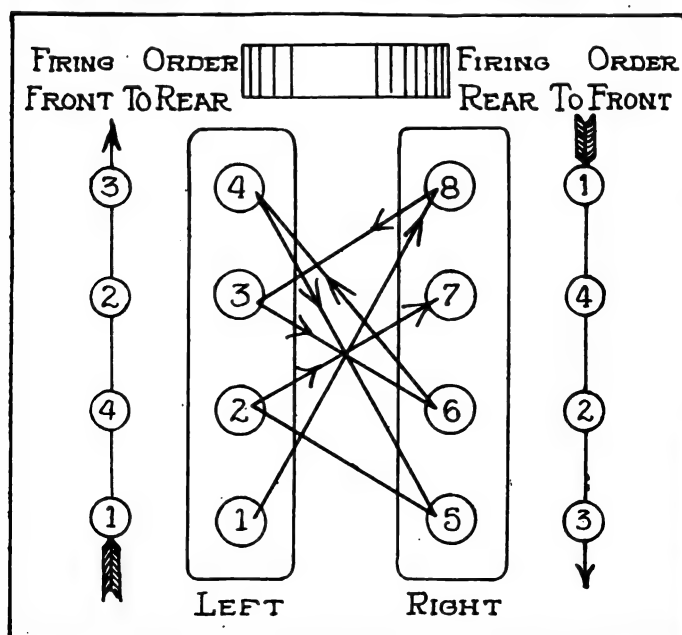
(J. E. M., Atlanta, Ga.)

Will you publish the firing order of the 1915 Cole eight-cylinder motor, and show a diagram of how this is laid out, in an early issue of your magazine, which I have read constantly for the past six years. I have derived much benefit from the correspondence and practical suggestions department.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

In the Cole Eight 1915 engine the two blocks of four cylinders each are set side by side and slanted at an angle to form a V, with the valves inside. The cylinders on one side are reversed with reference to the cylinders on the other side. Standing at one end of the engine the firing order of one block is 1-4-2-3. Passing around to the opposite end of the engine, the firing order of the other block will be the same as the first named block, that is, 1-4-2-3. For the convenience of the operator of the car the maker of the Cole Eight numbers the cylinders of the bank at the left of one standing in front of the radiator or engine from 1 to 4 (1-2-3-4) and those in the other bank 5-6-7-8, counting from the front.

Any eight-cylinder motor must fire alternately on the banks, and beginning with the first cylinder of the left bank and the last cylinder of the right bank, the firing order is, in the order of cylinders, as shown above. But as the cylinders have been numbered consecutively for the convenience of the car operator, when the firing is referred to by the manufacturer, as will be noted in the accompanying sketch, the firing is, 1-8, 3-6, 4-5 and 2-7. Or, to put it in another way, no matter at which end of the engine the operator may be standing the first cylinder to fire is the first of the left bank, and the



Firing Order of An Eight-Cylinder Cole Engine.

second is the last of the right bank. The order from these two cylinders thereafter is 3-4-2 alternately on the banks.

CARE OF CAR IN WINTER.

(M. L. G., Derby, Conn.)

Since cold weather has set in I am having some difficulty with my car. Can you give me some general advice that will help to get the best operation from the car?

H. W. Drew, service manager of the Nordyke & Marmon Company, Indianapolis, Ind., maker of Marmon cars, has the following advice to offer. It is the opinion of an expert and it would be well to follow out his suggestions:

At this season a few suggestions may be in order as to the easiest and best methods of assuring the most pleasant and effective winter operation.

As the quality of the gasoline supplied on the open market is continually decreasing, it is becoming more and more important to obtain the desired warm weather operating conditions in the motor at all times. The automobile engine, equally as sensitive to the cold as the human organism, should have extra covering in cold weather. An ideal warm weather operation can be secured by having the power plant and the surrounding air under the hood kept warm, as in summer. Fortunately, this is comparatively easy to accomplish, since the engine is itself constantly generating heat. It is well to use a radiator cover with an adjustable opening so as to prevent excess cooling in extreme weather. It is also well to

(When Writing to Advertisers, Please Mention The Automobile Journal.)

"I did not realize before this that magneto ignition was so much to be desired over a storage battery ignition. Your leaflet was very convincing."

A. M. Rochester.

You too should read this interesting booklet. Send for it today.

Bosch Magneto Company
204 West 46th St. New York, N. Y.

"I have used the same set of Splitdorf Spark Plugs for 69,000 miles - still good"

S.E. SCHOMBERG, Palo Alto, Cal.
STUDEBAKER


Made in all sizes and types to suit every car, motorcycle, motor truck, motor boat, aeroplane, tractor and stationary gasoline engine. If you can't get them from your dealer, send to us for them.

Splitdorf Electrical Co., Newark, N. J.

SPLITDORF SPARK PLUGS
WITH THE GREEN JACKET

HEINZE


High Tension
MAGNETO
Original in Design,
Superior in Quality.




Factories
Lowell,
Mass.

Branches
Chicago,
Ill.

Known
users
better



by all
as the
Magneto



Sales Offices
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Mich.

Branches
New York

HEINZE ELECTRIC COMPANY

see that the carburetor has a hot air connection to the intake manifold so that the cold air is preheated when going into the carburetor. The newer cars are also provided with an air choking device which gives an over rich carburetor mixture to aid in starting and rapidly warming up the engine.

With regard to the quality of gasoline: In some localities the gasoline commonly offered for distribution is of poorer quality than in others, but it is now almost always possible to obtain a higher test gasoline which, generally speaking, will prove more efficient in cold weather than a low test.

In this connection, bear in mind, however, that high-test gasoline does not necessarily mean better gasoline. In some cases a very light grade of fluid known as "Casing Head Gasoline" is used, which has such a low boiling point that it cannot be handled in an ordinary carburetor and it should be avoided.

The bad effects produced on engines in cold weather on account of low-test gasoline are difficult starting, missing fire, inefficient running for some time after the engine is started, fouling of spark plugs and sometimes the presence of gasoline mixed with the oil in the base on account of condensation in the cylinders. On this account extra care should be taken to see that the oil base is frequently drained and refilled with fresh oil. In very cold weather this should be done at least every 1000 miles. The grade of oil to use in cold weather is a medium heavy grade.

To prevent freezing the water circulating system we recommend simply the addition of either denatured or wood alcohol to the water. In order to make a solution which will not freeze up to 10 degrees below zero, remove two gallons of water from the circulating system and replace it with two gallons of alcohol. It must, of course, be borne in mind that alcohol evaporates somewhat more rapidly than the water, so that in order to keep the solution at its original strength it is desirable when refilling during winter weather to use half water and half alcohol.

COOLING SOLUTIONS FOR WINTER.

(S. A. M., Dane, Wis.)

Please give me a chemical mixture for an automobile radiator that will not freeze at zero and is not harmful to the motor.

A solution for an automobile cooling system that will not freeze at zero may be made as follows:

Water, 70%; wood alcohol, 30%; freezing point, nine below zero.

Water, 65%; wood alcohol, 35%; freezing point, 16 below zero.

Water, 70%; wood alcohol and glycerine in equal parts, 30%; freezing point, five below zero.

Water, 60%; wood alcohol and glycerine in equal parts, 40%; freezing point, 23 below zero.

Water-calcium chloride, three pounds to gallon, freezing point, two above zero.

Water-calcium chloride, four pounds to gallon, freezing point, 17 below zero.

Water-calcium chloride, five pounds to gallon, freezing point, 39 below zero.

Chemically pure calcium chloride will have practically no destructive influence on metal; chemically pure calcium chloride is much more costly than the commercially pure, the latter containing a varying volume of acid. This acid can be neutralized by adding ammonia or slacked lime to the solution until blue litmus paper wetted in it will not change in color to red. This test is unfailing and can be made any time.

When alcohol is used this will be more or less dissipated with use of the car or vehicle and the proportion lost should be restored. The test of the liquid is specific gravity, a reading of .960 by hydrometer indicating 33 per cent. wood alcohol and .950 41½ per cent.; a reading of .960 by hydrometer indicating 30 per cent. denatured alcohol and .950 38 per cent.

(When Writing to Advertisers, Please Mention The Automobile Journal.)



Ask For The Best Wrench

Your dealer will show you just the size you need for your tool kit, or for repair work.

He will recommend the COES wrenches as all good dealers have done for fifty years.

Coes Wrenches do not break, or wear out, in service life they cost less than any other tool made.



COES WRENCH CO. WORCESTER, MASS.

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cars have established a new field for luxurious light roadsters. You may judge their value by their standard of ownership.

Roadster \$825. Coupe \$1450.

CARS OF BEAUTY, STRENGTH, POWER, ENDURANCE

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Passenger
Family
Touring Car
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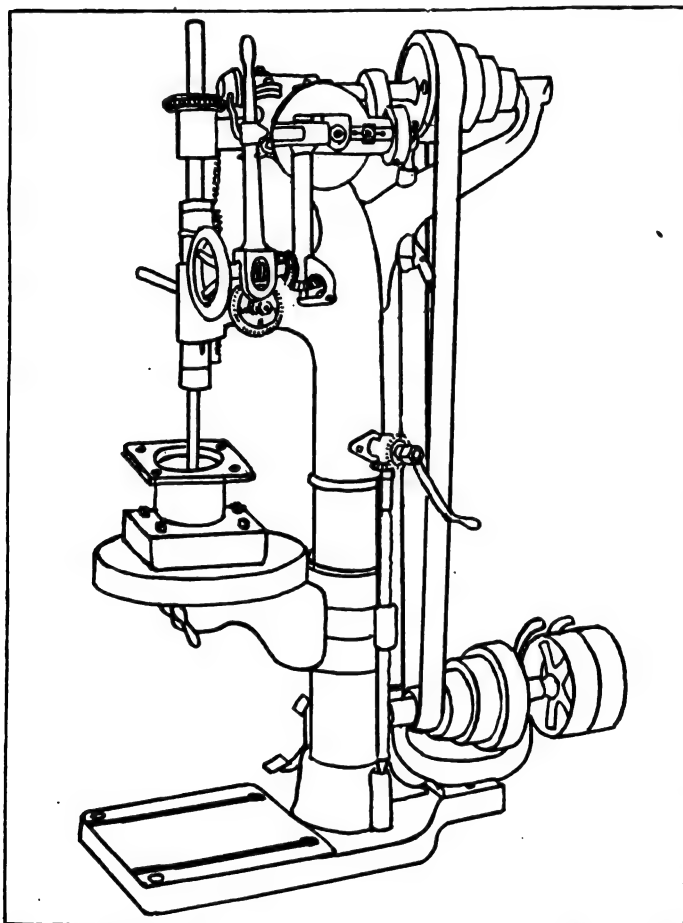
TIMES BUILDING, PAWTUCKET, R. I.

LAPPING IN PISTONS BY POWER.

(O. B. D., Hartford, Wis.)

Will you kindly favor with a suggestion as to some practical means of lapping in a piston except by hand power? Is it best to try to work the piston fast or slow?

A simple means of doing this, provided you have the tools, is to use your drill press. Take an old cylinder of the right size bore and set it up, tightly clamped, on the drill stand, head down. Make a dummy connecting rod so that one end fits the wrist pin or piston pin and the other end fits the drill chuck. Pin the rings in the piston so they won't turn and connect on the dummy rod and place piston in cylinder and centre under the drill spindle. Shift the belts or change the gearing of the drill press so that the spindle rotates at a moderate speed. Connect the dummy rod into the drill chuck and apply the power to the drill press. With the feed handle or feed wheel move the piston up and down in the cylinder at the same time that the piston is revolving. The vertical move-



Lapping in Piston on a Drill Press.

ment of the piston should be once in every two or three seconds. This will be found a very easy and effective method.

WANTS GAS TANK IN REAR OF CAR.

(J. E. T., Baltimore, Md.)

The main gasoline tank on my pleasure car is set under the front seat, and I want to place it at the rear of the frame, if there is any advantage in having it there. Of course, I must use pressure or vacuum feed; which is the best?

Answering your last question first, would advise that both feed systems you mention are dependable and efficient. In the pressure system, however, there is the disadvantage of it being liable to leak air pressure if the piping and connections are not installed properly and rigidly to prevent loosening through continuous vibration. There are several advantages in having the tank at the rear of chassis, chief among which is the fact that it allows the use of a shorter manifold, which will increase the efficiency of vaporizing and constant maintenance of fuel feed when climbing the steepest of hills.

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Near Lubrication Is As Bad As No Lubrication

From the very nature of its composition, grease can give only *partial* lubrication.

This simply holds off the effects of Friction *for a while*. But very soon, grinding, gritting, gears and bearings land the car in the repair shop.

The deficiencies of grease have led to the production of



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"SUPERIOR" or "COSY" Safe Garage Heater

A Wonderful New Invention. No Gasoline Fumes Can Enter Heater. All Air Brought From Outside Building.

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The reputation, performance, appearance and price of Inter-State cars prove their

EXTRA VALUE

Series T—Five Passenger Touring Car.
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Series TD—Divided Front Seat Touring Car.
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Series TC—850 lb. Delivery Wagon.

Inter-State Motor Co., Muncie, Ind.

FOR 1914-15-16 and 17 FORDS



Price Complete
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The windows are of plate glass and the doors open like those of a limousine. This top fits snugly and it will not rattle or squeak. The finish is the same as the fitting of the car. It makes an attractive, substantial body, giving all the comfort of the enclosed car.

TOPS FOR MAXWELL CARS

These tops are superior to other makes in design, construction, workmanship, material and finish.

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Seven passenger
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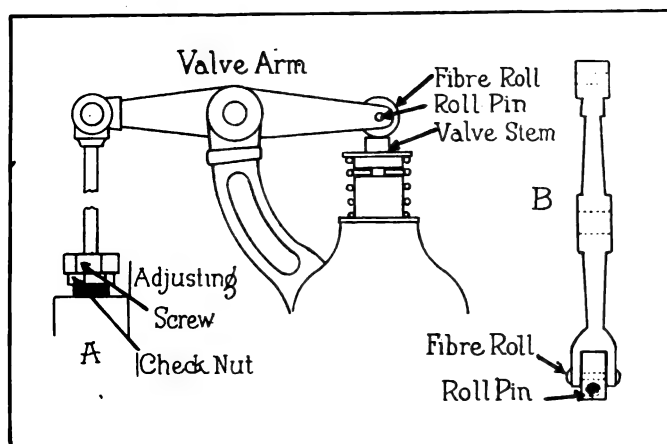
(When Writing to Advertisers, Please Mention The Automobile Journal.)

SILENCING OVERHEAD VALVES.

(E. K. B., Fort Worth, Tex.)

The valves on my car are of the overhead kind, and they have become very noisy during the past month. Can you tell me what is the trouble and how I can fix it myself, without going to much expense? I am a subscriber of your journal, which I think is the best to be found in this part of the country.

On the majority of overhead valve type engines small fiber rolls are generally fitted on the valve arm at a point where it touches the valve stem. This is done for the purpose of obtaining noiseless operation. As a rule these rolls are allowed to rotate as they please. At times they do this with a certain regularity, while at other times they remain stationary, which, of course, results in uneven wear of the rolls. When they are allowed to run unevenly the result will be uneven timing and an engine that does not operate smoothly. A simple way to overcome the noise you mention is to remove the valve arm and slightly rivet the pin upon which the roll is mounted. It will require only a little riveting to make the roll stationary. The valve arm and the roll when adjusted is shown in the sketch at B. You can then time the valves with some degree of accuracy. When the rolls become so



Illustrating How to Silence Noisy Overhead Valves.

worn that a gap larger than is required appears between the valve stem and the roll, adjustment can be made by letting out on the push rod adjusting screw or it does not require much force to turn the roll to a new position.

SPEEDWAY SCHEDULE FOR 1917.

(G. M. C., New York City.)

I have been a reader of The Automobile Journal for several years, and I would like to have you tell me, if possible, the dates on which the championship races on speedways will come next year (1917).

At a recent meeting of the Contest Board of the American Automobile Association, championship events were arranged as shown below. Incidentally, it was voted not to sanction any contests to be held on Sundays. Eight championship races have been scheduled for next year, one on each speedway. The minimum distance is fixed at 100 miles, but the distance may be extended according to the desires of speedway managers up to 500 miles, the maximum. It was also voted to have a minimum cash prize at the rate of \$100 per mile of race. The championship events have been scheduled as follows:

Indianapolis.....May 30	Tacoma.....July 28
Chicago.....June 3	Cincinnati.....Sept. 3
Omaha.....July 4	Providence.....Sept. 15
Des Moines.....July 14	New York.....Sept. 29

Dates for other speedway races were fixed in the following order:

New York.....May 19	Kansas City.....Oct. 6
Cincinnati.....June 23	Chicago.....Oct. 13
Kansas City.....Aug. 4	New York.....Oct. 27

The dates for races on the Philadelphia and Uniontown, Penn., speedways were to be fixed later by the Contest Board of the A. A. A. For further information apply to the association at either 437 Fifth avenue, New York City, or Riggs building, Washington, D. C.

WINTON
SIX

Who Nods First?

When you pass your friends out driving, who gives the *first* sign of recognition—you or they? Whose smile, nod or lifted hand flashes friendly greetings first—yours or theirs?

DO you find yourself saluting friends who turn their heads—after you have gone by—in a vain effort to identify you? And can't you imagine them asking, "Who was that?" without ever knowing?

Ever stop to think that salutations are always paid to the owner of an individualized car—by the owners of look-alike cars? It's true.

The distinctive car identifies its owner wherever it goes. It belongs to a particular person, not to O. Anybody. You see it coming, and you know whose car it is. Of course, you salute your friend, but unless yours is also an individualized car, the recognition is *not* mutual. He is gone without knowing who you are.

Why sink your identity in a commonplace, monotonous looking car, when you can have the flower of motor car quality and a distinct exclusiveness that precisely meets your personal taste by placing your order for a Winton Six? Our artists are at your service. Simply telephone or drop us a line.

Closed Car
Prices range
as low
as \$2800.
Open Cars
\$2485 to \$3500.

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131 Berea Road, Cleveland

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 are unequalled for motor lubrication, freer from carbon, economical because they protect the motor against mechanical wear, and the quantity required is comparatively small.

These are the claims of thousands of motorists,—some with years of experience,—who want full value, and more who know the value of high grade lubricants, and who know when they obtain satisfaction.

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1917 Show Issues

—OF—

THE AUTOMOBILE JOURNAL

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(Held Jan. 6-13.)

Advance Number Review
 December 28 January 10

Chicago Show

(Held Jan. 27-Feb. 3.)

Advance Number Review
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Boston Show

(Held March 3-10.)

Advance Number Review
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Also Service Stations for all these cars. All kinds of Repairing, such as Motor Work, Overhauling, Painting, Trimming, Etc., at moderate prices.

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It affords every detail of time and work of any number of machines, the labor, operating cost, revenue and earnings, with comparisons for any period, in one record book and day card for each truck.

The simplest and most comprehensive record ever conceived, adaptable for use with any method of house bookkeeping or independently, that can be made to serve as part of any method of accountancy.

The most intensely practical system of accounting ever devised, that can be maintained by a girl clerk and which has no limitations.

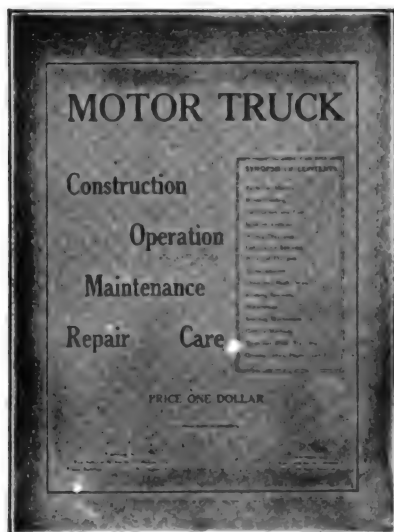
When you know the exact cost of truck operation and what is earned through the use of any vehicle, you have data of the greatest practical value.

Detailed information at request. When writing state number of trucks in use.

The Motor Truck

TIMES BUILDING

PAWTUCKET, R. I.



A work that is complete, wholly practical and deals with all subjects as the title implies.

Truck Care
Truck Repair
Truck Operation
Truck Maintenance
Truck Construction

Prepared for
Owners
Operators
Repairmen
Salesmen

\$1.00 the copy. In combination with a yearly subscription to Motor Truck (the great national authority on highway transportation, issued monthly) \$2.00.

This is the only book published dealing with business wagons, it is fully illustrated and represents a wonderful value.

THE MOTOR TRUCK
Times Building **Pawtucket, R. I.**

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Definite Cooperation

Let's go over the plan together. We figure that we should count as sales only the Old Sol Spotlights you sell—in other words when you get your allotment of the OLD SOL NITROJECTOR No. 100 and the Spotlights No. 70 and No. 77 we keep right with you with definite selling helps. This cooperation has been planned with the same skill that gave the Old Sol line its sales producing leadership.

OLD SOL NITROJECTOR NO 100

THE 100% PERFECT SPOTLIGHT

No matter what windshield lamp the car owner buys at first he will eventually get an OLD SOL NITROJECTOR No. 100. We know it is the best light that can be made answering all purposes and complying with every law for a no-glare lighting device.

We have planned a mammoth advertising drive—nation wide in its scope and volume—in full page and two page spreads.

We will link you up with this selling force. We will give you selling helps to use in your store. Handsome lithographed display stands will be sent you from your Jobber—booklets will be supplied in generous quantity with your name imprinted. Your Jobber will be ready at all times to offer you timely and definite advice and merchandising plans.

For Old Sol Dealers



This Display Stand is silent salesman for the Nitrojector Model 100 - given free to Dealers with initial order of Nitrojectors.

This Silent Salesman

invites the attention of everyone who visits your store. On your showcase or in your show window it will make many a sale. It displays the OLD SOL NITROJECTOR No. 100. Made of metal, has handsome, lithographed, colored illustrations of the general uses of the spotlights. On the counter side are full selling directions for your salesmen. This will be supplied you free with your initial order. Tell your Jobber you want it.

This is a page from a Jobber's catalogue showing the value the Jobbers place upon the OLD SOL SPOTLIGHT as a selling proposition.

These catalogs will tell what you want to know about the line. Look for them.



Booklets too! Yes indeed, a generous supply free to you. Tell your Jobber how many you can use. Your name and suitable business announcement will be imprinted on them. Ask for the NITROJECTOR No. 100 booklet and for the OLD SOL SPOTLIGHT booklet. Two of them. Each four pages illustrated with fine photographs tells motorists what they want to know about spotlights in an interesting sales-producing way.

Get that letter off to your Jobber to-day.

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BRIDGEPORT, CONNECTICUT, U. S. A.

Makers of Old Sol Windshield Spotlights and Electric Lighting Devices.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

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AUTOMOBILE JOURNAL

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Entered as second class matter, April 15, 1906, at the Postoffice at Pawtucket, R. I., under act of Congress of March 3, 1879.

Ten Cents
a Copy

VOL. XLII.

DEC. 10, 1916.

NO. 11

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Treasurer - - WILLIAM H. BLACK

Secretary - - - - D. O. BLACK, JR.

Published the 10th and 25th of each month by the

AUTOMOBILE JOURNAL PUB. CO.

Times Building, Pawtucket, R. I.

ONLY Four Weeks now remain before the opening of the New York Show, which marks the real beginning of the national motor car show season in the United States. For three months the season will continue, the Chicago Show coming three weeks after the New York exposition and Boston closing the season in the early part of March. During this period there will be scores of "local" shows in all parts of the country, these displays being smaller, but just as important to their localities as are the national exhibitions. This is the time when motordom looks for advance information on what the manufacturers have to offer for the next season and to determine the tendency in body design and engineering practise. While many makers announce their plans and show their next year models before the show season, a sufficient number are disclosed at the shows to make them indicative of what is in store for purchasers of 1917 pleasure car models.

ADVANCE Information from the manufacturing centres, both cars and accessories, makes it plain that as in the past the New York Show will be the accepted opportunity for the introduction of novelties. The information also indicates that on the whole the industry is making fewer changes for 1917 than in past years, being deterred partly by the belief that their cars satisfy the public and also because the immense volume of output during 1916 has not afforded opportunity to make the factory changes attendant upon the radical change in manufacturing a new model. Yet there will be a plethora of new things to be seen, and they relate to some of the fundamentals of the car and industry.

ENGINEERS Have Not ceased to search for means of refining the mechanism and bodies of motor cars; in fact, during the past year they have exerted more endeavor toward that end, and their efforts are reflected in the greater flexibility of the power plant, the adoption of the long-stroke engine, improvements in the clutch and transmission, refined methods of spring suspension and better ignition, starting and lighting systems. One of the big features of the shows will be the four-cylinder models with 16 valves, four to each cylinder. Among other features that are expected to be shown concern the more liberal use of electrical energy in the transmission and braking systems, and the adaptation of air pressure to stop the car. Among the accessories the novelties will be legion.

AS CONCERNS Bodies, the tendency as indicated by announcements already made is to adhere to the very pleasing streamline of last year. The lines have been further accentuated to bring out the characteristics of the design in better fashion and to express the individuality of the makes. To one who has studied the designs for 1917 that have been announced, there is apparent a worthy effort on the part of the manufacturers to take trucks and the like from their former conspicuous positions and to provide space for storage in concealed places about the car. In this way the beautiful lines of the models are retained. Many of the makers have contrived to make room in the tonneau or in the rear decks of roadsters for unsightly baggage. It would seem also that the most popular types of bodies will be the five and seven-passenger touring models, the two-passenger roadster and the limousine.



Every Model in this Reo Line Has Proved a "Best Seller"

THERE ISN'T A MODEL in that whole array of eight Reos but is the leader in its class.

EVERY ONE—EVERY SINGLE ONE "The Gold Standard of Value" in its price and capacity class.

THERE ISN'T A "slow mover" in the Reo line. Not one model that cannot and does not stand on its own footing. Not one that wouldn't be a leader were there no other Reo.

YOU KNOW WHAT IT MEANS to have to take a certain number of slow sellers in order to get another model that, for the time, has the call.

THAT HAS BEEN SHOWN us most forcibly from time to time when the factory got a little behind on one model or another and we couldn't ship "mixed car lots" to dealers.

NO MATTER WHICH—a Four or a Six; Roadster or Touring car; Closed car or Truck;—seemed as if the demand for one was as insistent as for another.

IN A WORD, REO stands on its own legs so to speak.

THAT'S AN IDEAL LINE from the dealer's standpoint. No need to tell you that. You know it.

AND THAT'S WHY 80 per cent of those distributors and dealers who handle this line, handle Reos exclusively—and handle the whole line.

AND THEY MAKE MONEY, those exclusive Reo representatives.

NO NEED TO TELL YOU that either, for you know it. The Reo man is the envy of automobile row in every city.

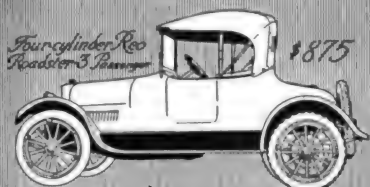
JUST AT THIS WRITING our problem is to supply present Reo dealers the cars and trucks they need to fill orders. And we seldom change.

BUT YOU NEVER CAN TELL—once in a great while we find it necessary to change—perhaps to get an exclusive dealer where our representative is now trying to live up to two religions.

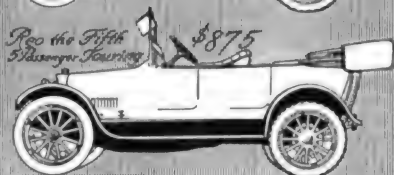
ONLY WAY, IF YOU WOULD secure the Reo line some day, is to keep in touch—write the Sales Manager in strict confidence—get in line for the Reo Line—and wait!

Reo Motor Car Company

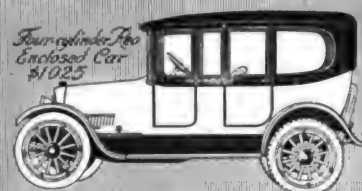
LANSING, MICHIGAN



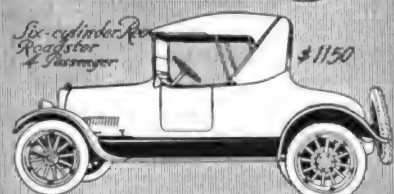
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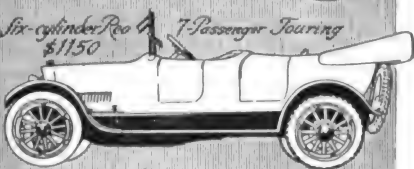
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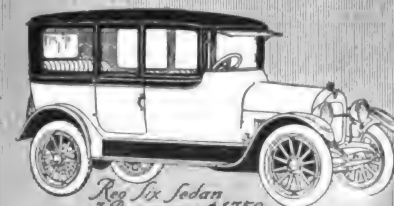
Four-cylinder Reo Enclosed Car \$1025



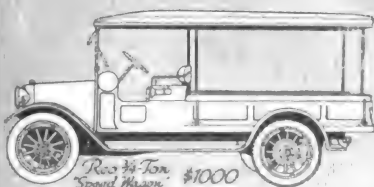
Six-cylinder Reo Roadster 4 Passenger \$1150



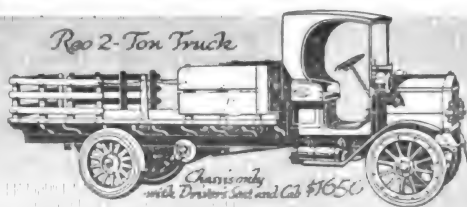
Six-cylinder Reo 7 Passenger Touring \$1150



Reo Six Sedan 7 Passenger \$1750



Reo 1 1/2 Ton Speed Wagon \$1000



Reo 2-Ton Truck

Chassis only with Drivers Seat and Cab \$1650

All Prices are f.o.b. Lansing, Michigan

173-A

"THE
GOLD STANDARD
OF VALUES"

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is
Economy”**

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“It was stated at the meeting of the Automobile Accessory Branch of the National Hardware Association on October 17th that manufacturers’ competition was the cause of some of the worst abuses in the accessory trade and that perhaps the greatest need of the distributor of accessories to-day is to have territorial control of a good advertised tire at a price which will cover cost of doing business.”

THIS IS THE HOOD PLATFORM:

A TIRE of quality — well advertised; exclusive territories to every Hood Dealer, giving him a good margin of profit, well covering the cost of doing business; real selling co-operation with the Dealer; service to the user; a rigid maintenance of the highest standards in the making of tires.

**Hood Tire Co., Inc.
Watertown, Mass.**

(When Writing to Advertisers, Please Mention The Automobile Journal.)

THE Automobile Journal

VOL. XLII.

DECEMBER 10, 1916.

NO. 9.



Grand Canyon of Arizona One of World's Wonders, the Main Chasm of Which is 217 Miles Long and 9000 Feet Deep.

The Southwest, a Land of Enchantment.

Relics of the Troglodytes Who Inhabited Caves in Arizona and New Mexico Many Centuries Ago Vie with Nature's Greatest Masterpieces in Attracting Tourists from All Parts of World to America's Land of Enchantment.

IN THE Pueblo country of New Mexico, and in and around the Grand Canyon of the Colorado in Arizona, Nature unfolds its scenic wonders with a setting of unique grandeur and splendor that eclipses the seven wonders of the world in point of interest. They not only offer a revelation for the eyes, but inspire deep thought of the kind that sends the mind romancing back through the ages in fanciful speculation on the ancient race of men that inhabited the cliffs and wandered about in the world's greatest natural park.

The bigness of it all is profoundly impressive when one gazes out over the broken topography of the Grand Canyon country, hundreds of miles in area, with cliff surmounting cliff, each making a step higher than the highest skyscrapers. Like a rivulet at a mountain's base the Colorado runs swiftly through a chasm of abysmal depth.

How to Get There.

The National Old Trails Highway, which leads out of Washington, D. C., and from Los Angeles, Cal., passes through the Pueblo country and through

Flagstaff, Arizona, where there is a connecting highway running north through the Grand Canyon.

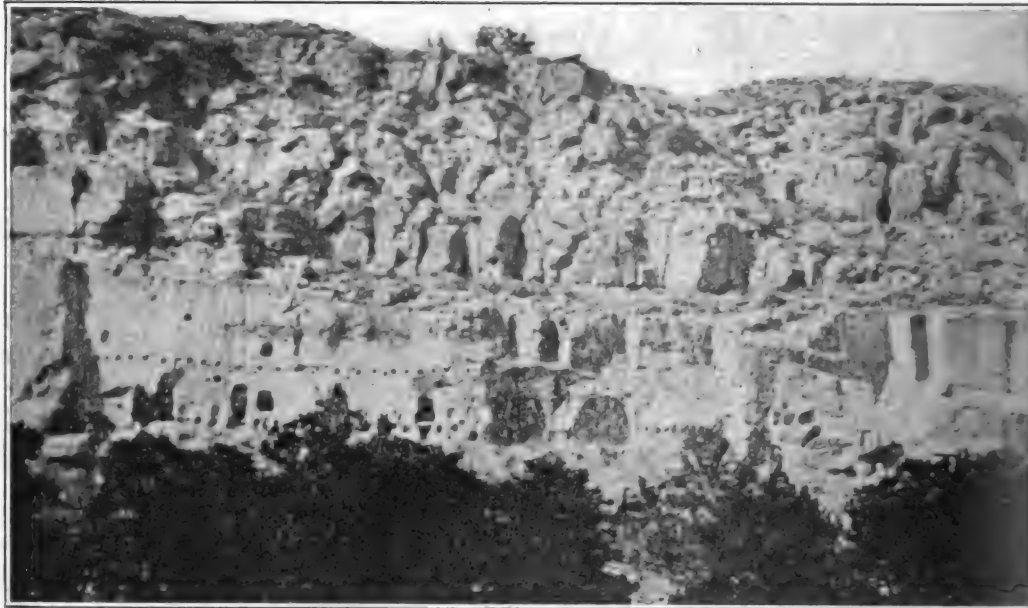
The tourist first breaks into the real centre of this vast land of enchantment in leaving Raton, N. M., en route for Santa Fe. There is the wonderland of wonderlands with more marvelous scenic features than exist anywhere in the world. Even the atmosphere has its own peculiar charm, being rare and dry, although stimulating in its effect upon the senses. The horizon and zenith seem to be nearer the earth and objects take

on a more definite outline and appear more vivid and fresh, while colors teem with the hues of the spectrum wherever the sun's rays strike.

It is a land of enchantment and the original inhabitants appear as weird to the newcomer in that territory as the animals in the zoo to a child upon its first visit. Here are also found ruins of habitations that were occupied by the oldest race of Americans of which there is any trace left. They lived in a period antedating most accounts in history and it was undoubtedly a prehistoric time.

As It Was Centuries Ago.

This is Pueblo country and the Pueblo Indians, unlike their brethren of the red skin, abjured all the advances of the white man to change their modes, dress, speech, customs and religions. They still adhere to the same type of abode and manner of eating and dressing as was handed down to them by their forefathers who met the Spanish and French explorers that came into their country over 300 years ago. The nondescript is present on every hand and the further



The Ancient Dwellings of Troglydites Who Inhabited These Caves in Arizona and



The Ancient Exchange Hotel, Santa Fe.

into this maze of marvels the traveler goes the more the unexpected becomes the expected.

Santa Fe and the country immediately about the city, is worthy of a stopover of several days and for an even longer period if one delights in delving into ancient lore. La Ciudad Real de la Santa Fe de San Francisco, as Santa Fe was called when it was founded by the Spaniards in 1605, 150 years before the United States became a nation, was a settlement, dating back into antiquity. For this reason it is now the leading centre of archaeological research in the United States and a school and museum of the American Institute is maintained there. It is in an old palace which has housed 76 rulers of Mexican and Spanish blood and 19 American territorial governors.

Before the White Man Came.

In this palace General Lew Wallace completed his final literary labors on his masterpiece "Ben Hur," and it is doubtful if he could have found a more inspiring abode in which to undertake such a work. When one has read the history of

the city and inspected the marvelous collection of Indian, Mexican and Spanish curios and relics within the building, he can easily see in ancient Santa Fe evidence of the scenes and atmosphere of the times when it was ruled over by Spanish priests and governors and again by marauding Indians during their temporary periods of occupancy when they fought the invasion of their country by the

white man of the 15th century.

For 20 miles east and west of the city and 50 miles north and south, these ruins stand as a monument to a long forgotten race which must have flourished in considerable numbers at the height of their existence. In one canyon alone there are over 1500 ruins.

Santa Fe as a Health Resort.

The city has an international reputation as a health resort for people afflicted with pulmonary troubles. It is 7000 miles above sea level, the air is rare and dry and the temperature there changes less than in most any other section of the country.

Going out of Santa Fe, on through Albuquerque, one encounters country with a history replete with tales of the conquests of the Spaniards and their relentless campaign to propagate their faith.

Passing into Arizona the first of the



The Old Spanish Palace Wherein Lew Wallace Wrote "Ben Hur," This View Showing the Hupmobile "Capitol to Capitol Car" Standing Before It.



New Mexico Many Centuries Before White Man Invaded the American Continent.

great sights of the Southwest that is encountered is a section of the Petrified Forest. This is looked upon as one of the chief marvels of the world. It is spread over several large tracts, the first of which is encountered six miles out of Adamana. Three miles further on is the second forest and the third and largest is 13 miles southwest of Adamana. There are two others, the Blue Forest and the North Sigillaria. The first named is seven miles southeast of Adamana and the latter nine miles north of that place.

Precious Stones Made of Wood.

Many thousands of fallen trees of gigantic size lie in these forests, all petrified by Nature's forces during the many thousands of years that they have been exposed to the elements. They are now in many forms, broken and splintered in sections, and some still retain most of their original form, but all are in the ultimate state of petrification.

They resemble at times a gigantic assembly of precious stones of all kinds and colors, the agate, carnelian, amethyst and topaz scintillating in the sun with untarnished brilliance despite the exposure to wind, rain, dust and heat for ages.

Some of the specimens are several hundred feet in length and from eight to 10 feet in diameter, and the cross sections where they were broken off still re-

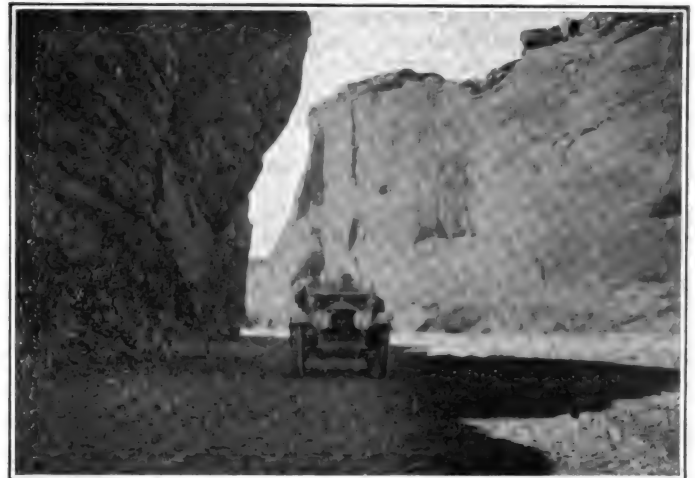
veal the form of the fiber, grain and vegetable growth that was alive when they reared their heads almost into the clouds.

Across one chasm, fully 50 feet wide, one of these mammoths rests like a natural bridge. The largest forest, which is reached through Holbrook, covers 80,000 acres.

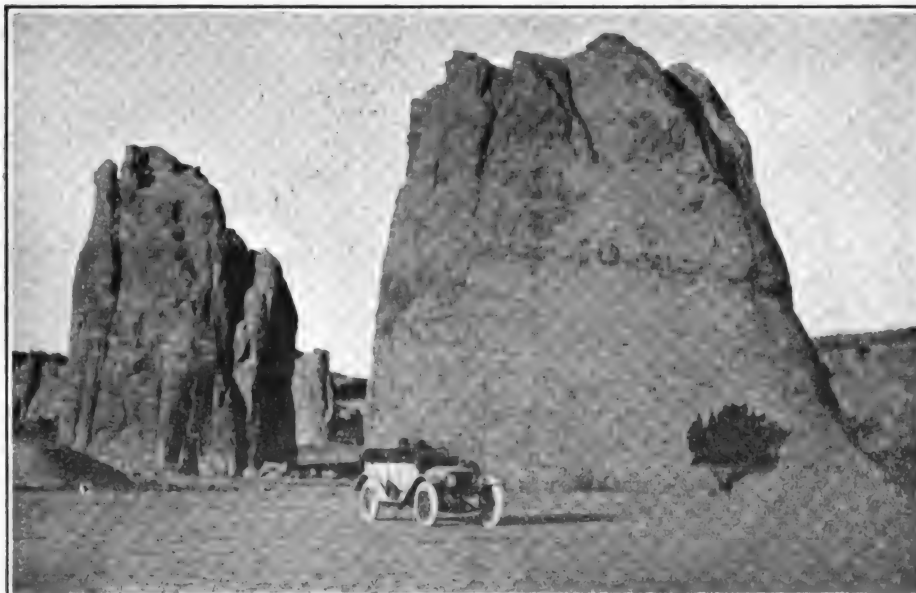
Throughout this section, hunting and fishing abounds and there are many interesting Indian villages where extraordinary and unusual religious ceremonies can be witnessed.

On the Rim of the Canyon.

Leaving Flagstaff the tourist takes the highway northward, a distance of 79 miles to Grand View Point, which is located on the rim of the Canyon, where one of the most wonderful views of the region is to be had. From this point the highway runs through a winding course for 14 miles along the rim of the Canyon to Eltovar Hotel, where another wonderful view is visible. From the latter point the highway turns southward again and



Level Roads Abound in the Southwest.



Nature's Whims Took Many Weird Forms in the Making of the Southwest, the View Showing a Geological Freak Called the Haystacks.

joins the main transcontinental highway at Williams.

The greatest minds of the world, upon first viewing this wonderful country, were at loss for words in which to describe their impressions. The rough, rugged contour of the landscape with the massive forms, standing out like groups of pyramids, mountains and huge embattlements, seem to speak from a long gone past.

Most Sublime of Spectacles.

It has inspired every one of America's great writers who have viewed it with almost speechless awe and they are almost unanimous in the expression that it baffled description; was beyond the power of the English language to describe and the most sublime of the earth's spectacles.

Without going further in an effort to convey an idea of the Canyon to the mind of the reader it is more practical to give its dimensions and topographical features if one is to grasp an idea of its proportions, wherein lies the great secret of its grandeur and mystery.

It is one of the great Canyons through which the Colorado river makes its course from Utah to the ocean. The main chasm is 217 miles in length and varies in width from 10 to 15 miles. This great channel was cut in a level plateau through strata after strata of earth and varies in depth from 6000* to 9000 feet.

No matter how many foreign countries a seasoned traveler may have explored, the Great Southwest never fails to enthrall and amaze him. It is the oldest section in the United States, so far as records of established civilization are concerned. Though the sun shines almost perpetually, the rarity of the air and the altitudes rob the rays of their objectionable features and combine to make a stimulating atmosphere that offsets any sense of oppression that might be expected. The skies are a marvelous shade of blue and the shadows cast by the sun are sharper and deeper than elsewhere.

The absence of humidity stays the tooth of decay, and awe inspiring mementoes of terrific terrestrial disturbances of unthinkable antiquity seem to have been events of but yesterday. The same preservative influence is responsible for the remarkable condition of the ruins of prehistoric civilization, ruins



A Few Indians Retain Their Original Methods of Living.

that are more the result of the strife of man than the elements.

In the last few years the great American desert has been transformed from a land in which life was a burden to a region that is peculiarly suited for recreation and sightseeing. Prodiges in road building have eliminated distance for the motorist, and practically everywhere can one find repair shops and hostleries that equal those in the East.

Sight to Be Seen.

Arizona has much for the motor tourist to see in the way of picturesque aborigine and Mexican life, and a wealth of architectural and other relics of a civilization that is supposed to antedate the Christian era. The Grand and les-

ser canyons, the Mojave, Canyon Diablo and the Canyon de Chelly; the Petrified Forest; the Painted Desert, with its grotesque natural stone obelisks springing from the flat desert floor; mountains whose bases lie at greater altitude than the tips of the highest peaks in eastern ranges, Meteor Crater and springs of boiling water—these and many other marvels of Nature's turbulent moods are the show places of that strange country.

In both New Mexico and Arizona, the states chiefly concerned in this article,

the motorist will travel among the clouds, so to speak, the routes seldom descending below an altitude of 5000 feet, except in the vicinity of the Colorado river. A trip across these commonwealths is a trip across a vast and irregular plateau, a realization of which will be startlingly thrust upon the traveler's attention when, in traversing some more or less level plain, he suddenly comes upon a gaping fissure in the earth and gazes down the dizzy depths to the levels which lie in the greater part of the rest of the world.

There is a fascination in this strange region of miraculous geological formations, parched prairies, snow clad mountains, lava beds and towering forests.



The Pueblo of Toas, Showing an Ancient Aztec Form of Community Dwelling That Was Prevalent in the Days of Montezuma, Before the Conquest of America.

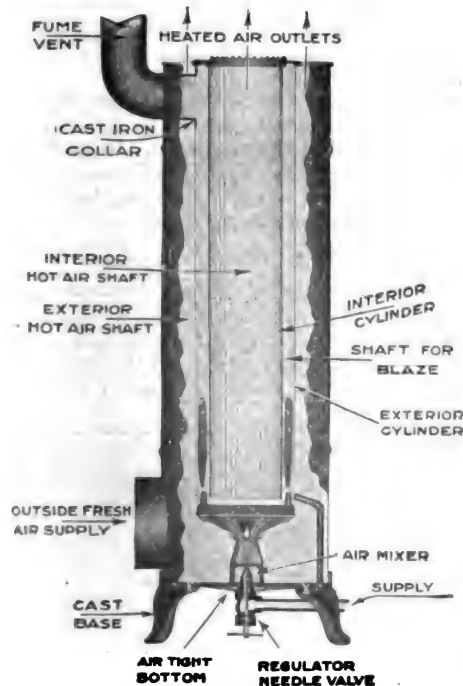


THE wise motor car owner knows that he must furnish heat in his garage for his car during the winter months if he is to derive the best service from the machine. He knows that if he stores it over night, or during a cold day, in a building in which the temperature is cold, he is likely to experience any or all of the following troubles:

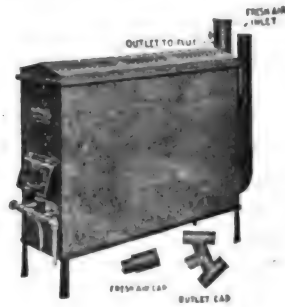
Frozen water in the radiator or water jackets, which will result in no end of trouble and expense to remedy; congealed grease throughout the lubricating system; cold fuel, which is hard to vaporize in a stone cold carburetor and results in difficult starting; excessive drain upon the battery to set the engine in operation when a self starter is used, and the deteriorating effects upon the rubber of the tires.

Starting in Cold Weather.

There is another injurious effect from starting a cold engine in a cold garage by an electrical starter, an effect that is not generally appreciated. When the engine does get under way the temperature of the whole power plant rises suddenly, possibly 100 degrees in a few seconds, and this sudden change certainly does not work for good in any part of the mechanism. Even the exterior of the car feels the effect, the paint often cracking and peeling.



The Reo Gas Heater.



Superior Garage Heater.

Without heating apparatus in the garage the average owner does not relish working about his car in spare moments in the winter. To avoid exposure in the cold atmosphere he is inclined to put off the necessary overhauling or needed repairs until warmer weather comes.

There are many ways of overcoming the unpleasant and costly consequences of a cold garage and a number of manufacturers specialize in apparatus that is specially designed for the purpose. For owners who do not wish to go to the expense of installing a permanent heating outfit in their buildings, there are a number of devices offered that just keep the engine warm, while others only provide heat for the carburetor, to facilitate starting. Some of the electrically operated engine heating devices are for use only in the garage, as are also those that

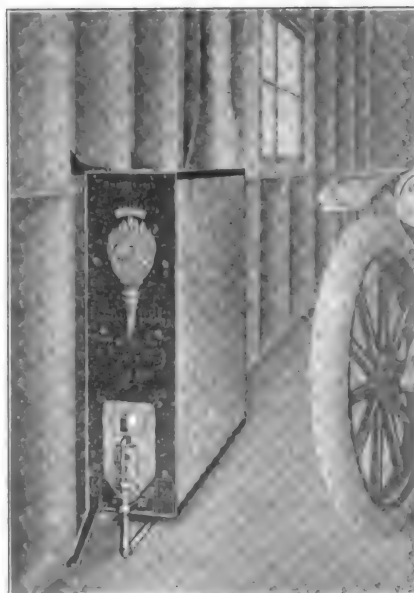
burn some kind of petroleum fuel. There are others though that are permanently fixed to the car under the hood and can be used either in or out of the garage.

Many types of heaters, however, are designed for the same purpose as the heating system in the home, to maintain a comfortable atmosphere in the building throughout the winter. Hot water attachments can be fitted to some of these heaters and the owner has the pleasure of having a good supply handy with which to wash up after he has finished making adjustments or cleaning his car.

Scientific Uses Gas Fuel.

The Scientific Safety Garage Heater, made by the Scientific Heater Company, Cleveland, O., was designed especially for small private garages. The maker claims that this heater operates on a different principle than a stove, which radiates heat, while the Scientific heater circulates heat. The heater gives an even distribution of warmth, transferring a stream of warm air, which protects the radiator, bearings, battery, springs, top and tires of the car and, incidentally, heats up the room so that the owner can work in comfort.

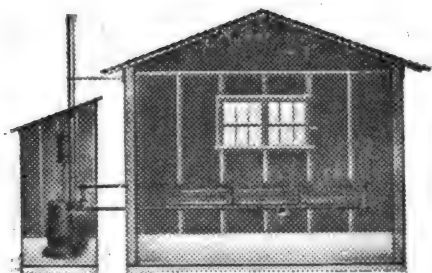
Gas is used as a fuel, but no matter how much gasoline is spilled on it or in the garage, there is no danger of an explosion. It is also fool proof, as no



Scientific Safety Heater.



"Wickless" Kerosene Heater.



Schleit Hot Water System.

matches are required to light the flame, ignition being provided for by a self-lighting device.

Scientific heaters have been on the market for several years. Three sizes are made, which sell at \$27.50, \$35 and \$50 respectively.

Superior Heater Is Popular.

The Superior Garage heater, in which is used either artificial or natural gas, marketed by the Superior Manufacturing Company, N. S. Pittsburg, Penn., is widely used by garage owners to maintain the garage at a normal temperature throughout the winter months. It is equipped with a pilot light that gives a constant flame.

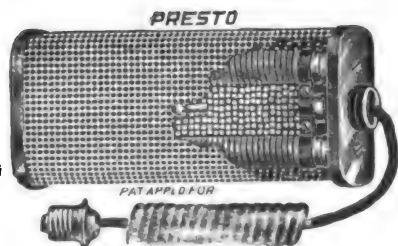
The heating flame may be turned off or lighted without the use of matches. It is so designed that any gasoline vapor that might be mixed with the air in the garage cannot be ignited by the flame and the fumes from the heater pass off into the outside air and do not contaminate the atmosphere in the room.

Kerosene Burning Heater.

"The Wickless" safety kerosene oil heater for garages, manufactured by the Safety Stove Company, Grand Rapids, Mich., has many unusual features which make it a distinctive product in that line. The heaters are not only self-regulating once they are started, but the burners are of a special design and will neither burn or wear out during the life of the stove. No wicks, springs, packing or levers are used in any part of the burning attachment, and there is no danger of gasoline fumes coming in contact with the flame, as it is completely enclosed from the atmosphere inside the garage. Several different sizes are manufactured, with or without water tanks. Prices range from \$16 to \$30 according to size.

Details of Reo Heater.

The Edwards "Reo" garage heater, made by the Edwards Manufacturing Company, Cincinnati, O., is a specially designed gas stove for heating garages of 4000 to 6000 cubic feet. The secret of its economical and safe operation lies in a specially constructed burner, which



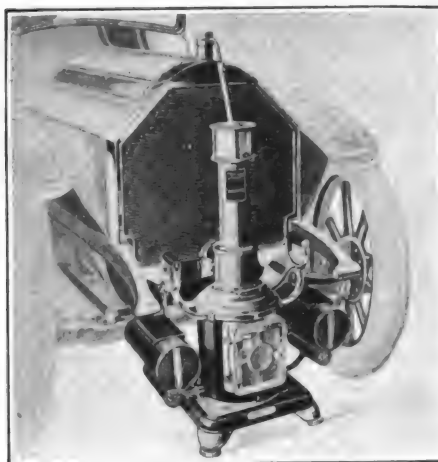
Presto Electric Engine Heater.

gives the maximum amount of heat with the smallest possible consumption of gas and permits the use of either coal or natural gas. The air is fed to the heating surfaces from the outside and the fumes are carried out again through another vent, the superheated air passing from the top of the heater into the garage. It is so constructed that it is impossible for gasoline fumes to enter the combustion chamber and is consequently safe and fool proof.

The manufacturer gives a year's guarantee and will supply any necessary new parts free of charge during that period or a new heater if the circumstances warrant it. Being only 38 inches high and 12 inches in diameter, it occupies but a small space in the garage. It sells for \$20.

Hot Water Heating System.

A coal burning hot water heating system, with automatic regulation, is made by the W. A. Schleit Manufacturing Company, Syracuse, N. Y. The heater is designed for the special purpose of heating garages and maintaining the temperature for from 24 to 48 hours with attention but once during that period and at a fuel cost of but a few cents a

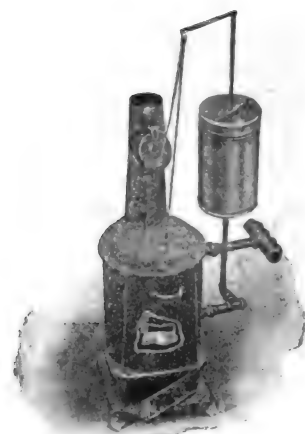


Neverout Heating Equipment.

day. One filling of water during the season is usually all that is required. The temperature is regulated by an automatic regulator which opens the draft when a high temperature is required and closes it when the temperature becomes too high.

It is to be located in a small house outside the garage to comply with insurance laws in the different states. Heat passes through the pipes that carry the hot water to the radiators, which are placed in front on the wall at the back of the house where the heat will circulate first about the radiator of the car where it is most needed.

They are made in six different sizes for garages of from one to six cars capacity. The prices are \$50, \$60, \$75, \$90, \$100 and \$115 respectively and include everything necessary but the smoke pipe. A metal house specially designed to contain the heater is also sold by the company. These are four feet square and six feet in height and can be quickly assembled.



No. 200 Ripple Garage Heater.

The Neverout auto radiator and garage heater directs a current of warm water through the circulating system of the car to keep the engine warm. Kerosene is used as a fuel and two separate tanks hold two gallons of the oil which will last from 36 to 48 hours. The flame is protected by a safety screen that eliminates any danger from explosions resulting from gasoline vapors being ignited by coming in contact with the flame.

The Neverout is made by the Rose Manufacturing Company, 910 Arch street, Philadelphia, Penn., and sells for \$25.

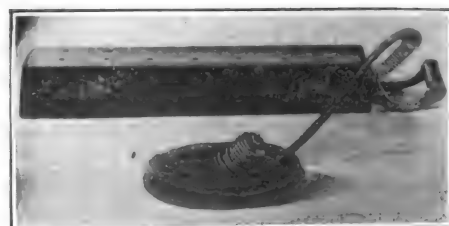
Coal, Coke or Wood Fuel.

The Ripple Manufacturing Company, Grafton, Ill., manufacturer of a general line of heaters, sell a considerable number of their No. 200 models for use in garages. The heater is made of cast iron and steel plate. Either coal, coke or wood can be used as fuel and the fire is controlled automatically by a float, which rises and lowers with the expansion and contraction of the water, the float in turn opening or closing the drafts and fuel door. About one scuttle full of coal a day will operate the heater, which will heat 800 feet of 1 1/4 inch pipes.

The heaters are 40 inches high, 24x24 inches at the base and weigh about 275 pounds packed for shipment. With Ripple's expansion regulator, two pipe manifolds and vent pipe, the No. 200 heater sells for \$42.50.

Fuller & Warren Devices.

Several styles of garage heaters are manufactured by the Fuller & Warren Co., Troy, N. Y., which use either coal or natural gas as a fuel. All the heaters, however, either come equipped with hot



Konsrv Combination Equipment.

water heating arrangements or can be fitted. This is a specially desirable feature as a plentiful supply of heated water in the garage in the winter time is found very convenient for many purposes.

The prices range from \$32.50 to \$307.50, according to style, and will heat buildings with a floor area of 396 square feet to 1360. The engineering department of the company will advise purchasers, upon application, the kind of installation necessary to fulfill their special requirements, as there are no two cases that can be handled alike.

Presto Electric Heater.

The Presto electric heater, made by the Metal Specialties Manufacturing Company, 730-738 West Monroe street, Chicago, Ill., is built in oval shape, which makes it adaptable to many positions about the engine. The twin heating elements extend the full length of the heater, about 6½ inches. It is 3½ inches wide and 1½ inches thick and is absolutely fire proof and indestructible in ordinary usage. It gives a strong, uniform heat, and as the resistance cannot vary on account of the length of the wire connection, the heating element never becomes hot enough to ignite any gases, oil or grease.

Model No. 200 sells for \$3.50 complete with cord and attachment plug ready for use on 110-volt circuits, either direct or alternating current.

The electric engine heater made by the Hughes Electric Heating Company, 215 W. Schiller street, Chicago, Ill., is a black enamel metal shell, shaped similar to an ordinary dry cell and perforated to allow for circulation of the heated air that comes from the heating element.

The rugged heating element consumes one-tenth of a kilowatt an hour and gives off just enough heat to keep the radiator from freezing and prevent starting trouble. In severe cold weather, however, the maker advises that the hood should be blanketed to hold in the heat. It is fireproof, being well insulated, and comes equipped with 10 feet of cord.

Konsrv Electric Equipment.

The Konsrv Electric Company, 2041 East Third street, Cleveland, O., the maker of Konsrv engine and radiator electric heaters, states that it costs approximately \$1.50 a month to keep a car warm in a cold garage with Konsrv equipment. This make of heater, which comes either for use in connection with 110 volt current and for garage use only, or as a combination that can be used either on 110 volt light current or the six volt current from the battery of the car, is designed to be placed beside the engine to keep the water of the cooling system from freezing and to keep the gasoline and carburetor warm. Konsrv heaters are fully guaranteed and sell for \$5 for model No. 1 and \$7.50 for the combination type.

Detailed information about the devices described in the foregoing can be obtained from the manufacturers. When writing it will be to your advantage to mention this magazine.

Close of the Racing Season.

Uniontown Speedway Opened With Loss of Five Lives--Another Lost in Arizona.

THE opening of the speedway at Uniontown, Penn., was attended by five fatalities and over a dozen cases of serious injuries to drivers, mechanics and spectators. Two of the country's best known racing drivers met their death during the Universal Film Trophy race, which was the opening event, and two men were killed during the elimination trials.

Hughie Hughes and Gaston Weigel, the latter mechanic for Galvin, were instantly killed, while Galvin sustained injuries to which he succumbed several days later.

On Monday of the same week C. M. Heist of Sharpsburg, Penn., and F. E. Bush of Pittsburg, his mechanic, were killed when the front axle of the car which they were trying out broke. At the time of the accident they were going better than 65 miles an hour.

The race was won by Louis Chevrolet, in his Frontenac car, with Dave Lewis in a Premier second and Ralph De Palma third in a Mercedes.

The cause of the accident resulting in the death of the two prominent drivers is not known, as both the occupants of the death car died before an explanation could be obtained. It is thought, however, that something went wrong with the steering apparatus in Galvin's Premier, which placed the car beyond his control.

On the 62nd lap Hughie Hughes had run his Hoskins special into the guard rail in front of the press stand, near the centre of the speedway stretch on account of engine trouble. He had walked as far as the stand when Galvin's car, which was thundering down the course, suddenly swerved and shot into the Hoskins special with a terrific impact. Both cars were crumpled up and the rail and press stand were broken into a pile of timber and splinters. Hughes and Weigel were found to have been instantly killed and Galvin to be suffering from many internal and external injuries. Ten of the spectators in the stand, mostly newspaper men and writers, were seriously injured.

The race was for 112½ miles, 100 laps around the track, for the \$3000 Universal Film Trophy. Chevrolet covered the distance in 1:14:12½, taking the first money, \$1000. Dave Lewis, who received \$700 as second prize, covered the distance in 1:16:36½. De Palma's time in third place was 1:17:56 1/5. He received \$500. Barney Newgard was fourth and won \$400, and Milt McBride finished fifth, earning \$300.

A race of 54 miles for a prize of \$500, competed for by dealers, was won by L. I. Fetterman of Pittsburg, in a Peerless car in 40 minutes and 18 seconds. F. M. McCarthy was second and W. L. Robinson third.

The new Uniontown speedway is a 1¼-mile board saucer, banked at the turns to sustain a car traveling at a speed of 120 miles an hour. The angle of the turns is very sharp, as is also the pitch of the track. The opening event had been widely advertised, consequently the sequence of unfortunate accidents were placed in an exceptionally conspicuous light.

Hughie Hughes was a racing driver of international fame and since coming to this country from England 10 years ago he had become very popular on the American tracks. He had been in the racing game for over 13 years. He drove a Dietrich car in the famous Gordon Bennet race in France in 1904. He won the Savannah Trophy race in 1911 and won the Tacoma Potlach contest in 1914. He was 31 years of age and was on a leave of absence from the British Aviation Corps when killed.

FATALITY IN RACE AT PHOENIX, ARIZONA.

The 100-mile race at the state fair grounds, Phoenix, Ariz., on Nov. 30, was won by R. H. Delno in a 16-valve Stutz. His time was 1:38:29.25. R. E. Lambert, in a Spa, finished second in 1:42:00.5, and Roy Meacham, driving a Mercer, finished third in 1:46:12.

The performance of Pete Thomason, in a Ford, was a big feature of the contest. He finished fourth in 1:49:26 and would have been in the money had his machine not thrown a tire in the 95th lap. Up to that time his machine had been running continuously without a stop.

The Hudson car, driven by R. G. Armstrong, plunged into a fence on the seventh lap of the race and his mechanic, W. M. Dennen of Oklahoma City, was killed.

EDDIE RICKENBACHER WINS ASCOT SWEEPSTAKES.

The 150-mile sweepstakes race, the last of the championship award series for the year, held at Los Angeles, Cal., on the Ascot speedway, was won by Eddie Rickenbacher, driving a Duesenberg car. His time was 2:13:15.2.

Earl Cooper, driving a Stutz, crossed the tape in second position after coasting half a mile with his gasoline tank empty. Eddie Pullen and Grover Ruckstell, both driving Mercer cars, finished in the order named.

The Mitchell Motors Company, Racine, Wis., has announced an advance of \$100 in the price of the Mitchell and the Mitchell Junior.

CONSOLIDATION OF ENGINEERS.

Tractor, Aeronautical and Motor Boat Engineers Are To Merge with S. A. E.

The movement toward standardization in tractor engineering is rapidly gaining momentum and support. It is quite generally appreciated that standardization will prove as useful in the development and production of large numbers of tractors for farm and other work as it has proved in the case of the automobile.

The work of all the engineers engaged in the development of the internal combustion engine is closely allied, to a considerable degree, and the matters that now and have been engaging the attention of the divisions or sub-divisions of the Standards Committee of the S. A. E. relate closely to the production of tractors, including work on anti-friction bearings, carburetors, fittings, silent chains, electrical equipment, engines and transmissions, as well as iron and steel materials.

As much of this work tends toward the same end, it is generally believed that a consolidation of all the engineering societies engaged in the various industries, where the internal combustion engine is the source of motive power, would be of great benefit to not alone the individual members and the firms they represent, but also to the public at large and dealers.

The aeronautical and motor boat engineers, it is understood, will consolidate with the S. A. E., and it is expected that the tractor engineers will also identify themselves with that organization. Co-operation is also looked for from the American Society of Agricultural Engineers and the National Gas Engine Association in the work on the standardization of tractors with references particularly to such matters as ratings.

With all these organizations combined, it is proposed that the name of the society shall be the Society of Automotive Engineers, which would be descriptive of the wide activities of the enlarged organization. It is also proposed that a vice president, representing, in each case motor car, aeronautic, tractor, marine and stationery combustion engines, should be included in the board of governors. By merging with the S. A. E., all the members of the other societies would have the benefit of the well established organization now conducted by the Society of Automobile Engineers. This consolidation would not only have its favorable effect upon the industries represented, but would prove almost invaluable to the nation in international trade and war times.

"BUY ELECTRICS" CAMPAIGN.

Since the affiliation of the Electric Vehicle Association with the National Electric Light Association, an intensive campaign has been in progress to stimu-

late the general use of electrically propelled vehicles by members of the association.

Herbert A. Wagner, president of the organization, has sent a circular letter to all the companies that are members, urging them to order at least one electric truck during the coming year for delivery, and announced that his company had placed an order for 25 electric trucks for resale.

President Wagner said in his letter: "The example and active promotion of the use of electric vehicles by central stations will have great influence in bringing about their general use by the public, which will in turn reflect to the benefit of central stations in securing a very desirable off-peak load in battery charging. One central station is now deriving a yearly income of about \$650,000 from the sale of current for recharging electric vehicle batteries, while many other central stations are enjoying substantial revenues from this profitable class of business."

PHILADELPHIA POLICE CAPTURE AUTO THIEVES.

A band of automobile thieves have been rounded up by the Philadelphia police. It is believed they are responsible for the loss of at least 100 cars reported as missing from New York City and Philadelphia.

It is understood that the headquarters of the band was located in Clementon, N. J. A barn was located in Ambler, where four or five machines a week have been taken for the purpose of changing them over and eradicating means of identification. The first two men arrested in connection with the thefts were brothers, as were also the second two. An automobile, from which one of the prisoners was taken, was found to have been changed in several respects and the engine number had been filed off.

A. A. A. ANNOUNCES RESTA AS 1917 CHAMPION.

The A. A. A. contest board under which the speedway automobile racing contests are held throughout the country, has announced Dario Resta champion racing driver for the season of 1916.

The last race carrying points toward championship honors was held on Thanksgiving Day. Neither Resta or Aitken were entered. Resta is at the top of the list with 4100 points, Aitken second with 3440 points and Rickenbacher third with 2910 points.

A banquet will be given to the 1916 speed king in Chicago on Feb. 1 under the auspices of the Chicago Automobile Club and at that time Chairman Kenner-

dell of the A. A. A. contest board will officially crown the young Italian and he will be presented with the Bosch trophy, a beautiful cup offered by the Bosch Magneto Company as an award to the champion race driver of the 1916 season. Resta also gets the \$2000 in cash which the Bosch company offered as a prize for the winner and also \$5000 of the \$10,000 prize money put up by the B. F. Goodrich company.

Johnny Aitken will collect \$4000 in prize money for standing second to Resta and E. V. Rickenbacher \$2500.

SCRIPPS-BOOTH OWNERS AVERAGE 24.42 MILES.

The Scripps-Booth Corporation, Detroit, Mich., recently sent out a letter to every owner of a Scripps-Booth car with a return card enclosed, asking that the owner state what mileage he was obtaining, not only under favorable conditions, but during the entire time he had driven the car.

The average of the many hundred replies received showed that owners of Scripps-Booth four-cylinder cars were obtaining an average of 24.42 miles per gallon of gasoline and that owners of Scripps-Booth eight-cylinder, four-passenger models were securing an average of 17.57 miles per gallon.

Some drivers of the four-cylinder cars reported mileages of 30 and 32 miles to the gallon, while eight-cylinder drivers reported averages of from 15 to 20 miles to the gallon.

OVERLAND HAS POSITION OF HONOR AT SHOWS.

The Willys-Overland Company of Toledo, O., has been awarded the position of honor at the national automobile shows to be held in New York and Chicago in January. This is the fourth consecutive year that the company has been given the choice places in the big shows.

The allotments of the space are based on the volume of business done by the manufacturers and only facts and figures are taken into consideration in figuring out those entitled to preferred positions.

In speaking of the distinction won by the Willys-Overland Company for the fourth consecutive year, John N. Willys, president of the company, said:

"During the 12 months ending Sept. 30, 1916, we sold 174,273 Overland and Willys-Knight cars—a volume of business totaling almost \$100,000,000.

"We won first place at the New York and Chicago shows in 1915 for a total volume of business of more than \$50,000,000.

"Not only in this country and in Canada did our sales show such gratifying increases, our shipments abroad have exceeded all expectation. In spite of meager shipping facilities we have been able to export this season as many cars as we sent abroad during all the preceding years."

Movie Stars and Motor Cars.



Captivating Vivian Martin.

"HOW Did They Do It?" is frequently heard in darkened "movie" houses after the climax of a thrilling play. "How they did it" in the Paramount play produced by Morosco, "A Son of Erin," is shown in the view at the left. The hero is Dustin Farnum and the heroine Winnifred Kingston, Pallas-Morosco stars. Their parts were simple as compared with the risks taken by the camera man and his assistants. Notice how the camera man is tied to the front of the car, and supported by the director of the play who stands on a box resting on boards fastened to the front axle.

At the top of the page is captivating Vivian Martin, another Morosco star, who has enthralled thousands. This is a "between acts view," showing the "Queen of the Movies" in an unconventional seat on her newest motor car.



Dustin Farnum and Winnifred Kingston in "A Son of Erin."



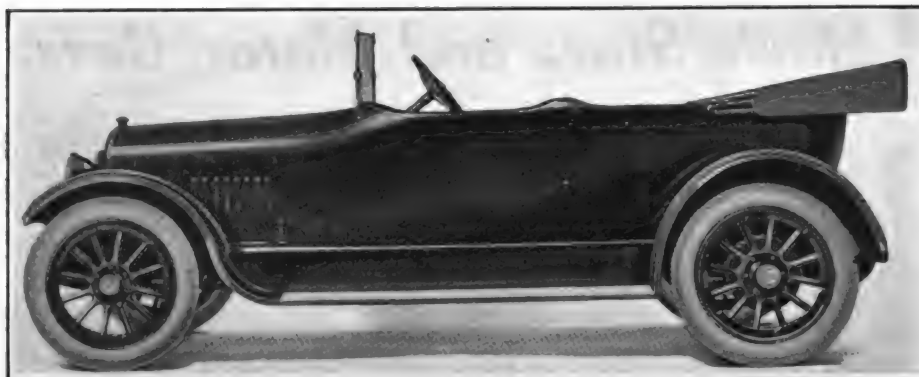
Leaping a Chasm in a Maxwell Stock Touring Car.

The small view in the centre well illustrates the dangerous occupation of moving picture actors and actresses. The motor car, a stock Maxwell touring model, carrying two actors and an actress, is seen hurdling the Las Posas Creek, near Camarillo, Cal., a chasm 33 feet wide and 21 deep.

At the bottom of the page Anita King and Victor Moore are "registered" as they appeared in the Paramount-Lasky picture, "The Race," which concerned a transcontinental "brush" between the poor young lady, who was trying to save her father from financial ruin, and the scion of a wealthy parent. Needless to say, the poor young lady won, after many thrilling and dangerous occurrences, and they married and lived happy ever after.



Victor Moore and Anita King as They Appeared in "The Race."

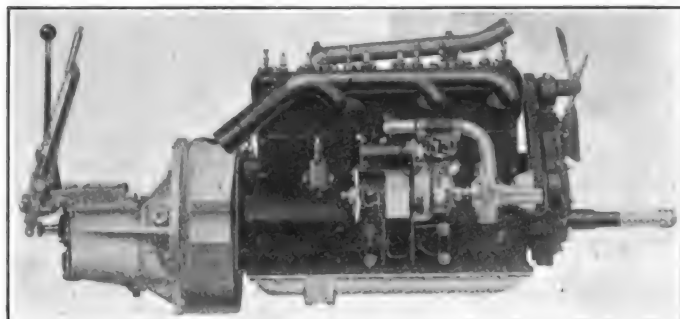


Pilot Five-Passenger Touring Car.

IN ANNOUNCING the new series Pilot Six-Forty-Five, the Pilot Motor Car Company, Richmond, Ind., states that the two larger models previously sold, the Six-Seventy-Five and the Six-Fifty-Five, have been discontinued. For 1917 the entire efforts of the Pilot organization will be concentrated upon the production of the Six-Forty-Five only. The exclusive output of one chassis model, together with the erection of a large addition to the company's plant, will enable the Pilot company to about double the volume of production of last season.

45 H. P. Block Test Engine.

The Six-Forty-Five Pilot is provided with a block cast six-cylinder engine of 3½-inch bore and five-inch stroke and L head design, for which the S. A. E. horsepower rating is 23.43 and the



Six-Cylinder Unit Power Plant.

maker's 45. The cylinders are cast integral with the top half of the crank case, the valves are enclosed, yet accessible, and the cam, pump and generator are driven by helically cut gears enclosed in an oil tight case.

Lubrication is by a combination force feed and splash system, a pump delivering lubricant direct to all bearings. An oil gauge on the engine base shows the amount of oil in the crank case at all times.

Centrifugal Water Pump Used.

A centrifugal pump operates the cooling system in connection with a cellular radiator and a pressed steel fan that is belt driven.

The carburetor is a specially designed instrument, made especially for the Pilot engine. It is hot air jacketed and receives its fuel by the vacuum system from an 18-gallon gasoline tank carried in the rear of chassis, where it is easy

of access and tends to a proper distribution of weight.

The electrical system is Delco make. The starting motor operates through a Bendix drive and the lighting equipment includes a Gould storage battery and large bulb headlights with dimmers. The tail lamp illuminates the license bracket and the system is of the single wire type.

Unit Power Plant Employed.

The clutch and gearset are in unit with the engine, and the first mentioned is of the dry plate disc type. The gearset is of the selective sliding type with three speeds forward and reverse and the gears and shafts are of nickel steel. The tubular propeller shaft is fitted with two enclosed universals and drives through a spiral bevel gear. There is a torsion rod, the forward end of which is fitted with double spring buffers and ball and socket joints.

The rear axle is of the full floating type and has vanadium steel shafts. The differential gears are easily adjusted and are easily removed when necessary.

Fifty-two-inch cantilever springs are used at the rear, while the front set

are of the semi-elliptic type, 36 inches long. The brakes are of the internal expanding and external contracting type, amply large and fitted with equalizers that allows one to have constant equality of pressure at all times.

Wheelbase is 119 Inches.

The wheelbase of the new Pilot model is 119 inches. The wheels are artillery type with demountable rims and fitted with 32 by four-inch tires, non-skid in the rear. One extra rim is furnished with each car.

The front axle is an I beam, drop forged, and the steering gear of the irreversible worm and sector type. There is a polished walnut steering wheel and provision is made for adjusting easily and quickly any part of the steering system that is subject to wear.

Drive is from the left hand side and control is at the centre and is of the ball and socket type. The gear shift and

Pilot Line for One Chas- In Which Is 45

brake levers are connected directly to the transmission case.

Description of Bodies.

Pilot five-passenger touring bodies are distinctive streamline design. The body is of double cowl type and the adjustable rain vision ventilating windshield is modeled to conform to the cowl lines. The four-passenger roadster known as the "Get Chummy," is also streamline design, with an aisleway between the front seats. The rear seat affords ample accommodations for two passengers, being 41 inches wide. There also is a large suit case compartment, entrance to which is had through a section of the back of the rear seat, which lifts out, making a large opening into the curved back of the body. There is ample room for a suit case, all necessary tools and whatever packages, etc., the average driver is likely to carry.

This form of construction permits of a perfectly smooth and gracefully sloping deck without parcel door or panel to break the continuity of its outline. A



Interior of the "Get Chummy" Pilot Four-Passenger Roadster.

1917 Has But sis Model, H. P. Engine.

point of importance attained by the employment of this design, as claimed by the maker, is that neither water nor dust can reach the interior of the compartment.

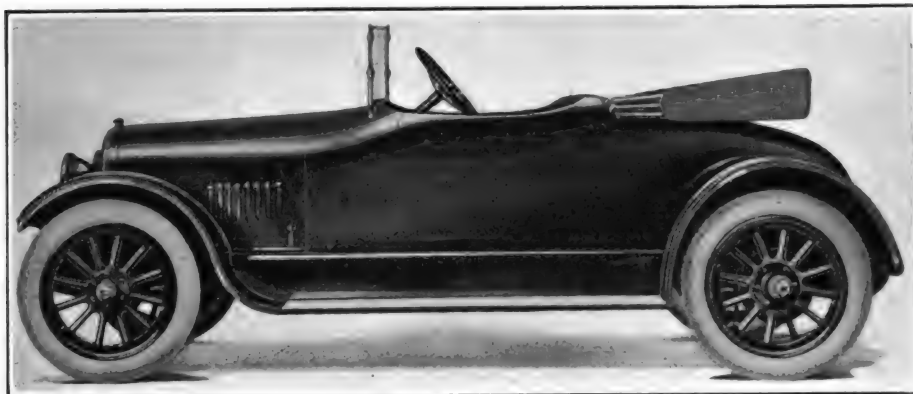
Uses Genuine Leather.

The upholstering of all models of the Pilot car is carried out in genuine leather, curled hair and steel springs, and the cushions are unusually deep and comfortable. The standard finish for bodies, wheels, frames and running gear is dark Brewster green, while the fenders, hood and dust shields are in black. Lamps are in black with nickel trim.

Equipment includes an electric engine driven horn mounted under the hood and operated by a button on the centre of the steering wheel; a speedometer of magnetic type, mounted on the dash; a one-man top with dust cover and locking top holders, and a single tire carrier in the rear of the chassis.

Both five-passenger "Double Cowl" touring and four-passenger "Get Chummy" Pilots are listed at \$1150.

These new Pilot models are now in



Pilot's "Get Chummy" Roadster.

production, and the company reports unusually large sales and orders from all parts of the country.

BEARING SERVICE COMPANY HAS VALUABLE DATA.

The Bearings Service Company, which recently opened branches throughout the country to give bearing service, has collected and compiled the most complete data in existence covering the bearings used in all automobiles manufactured in the past or present.

The assembling of all this information became necessary when the company undertook to supply the most perfect service obtainable, as they had to be able at a moment's notice to tell the type and the correct size and number of every anti-friction bearing in every automobile that has been built in the United States. A. K. Hebner, general manager of the company, in explaining the position the company holds in the trade at present, says:

Supposing you had an old car and by some mishap a bearing in some location was out of commission. Your parts book probably would have disappeared long ago and all that you had before you was the damaged bearing. It is unlikely that any garage owner in your neighborhood would have any such a part. Your car consequently would be laid up and you would have to wait until the garageman could write to the factory where your car was made—providing, of course, that the company still was in existence. It might mean a delay of from a week to a month before you could get the part and you might never be able to get it through this channel.

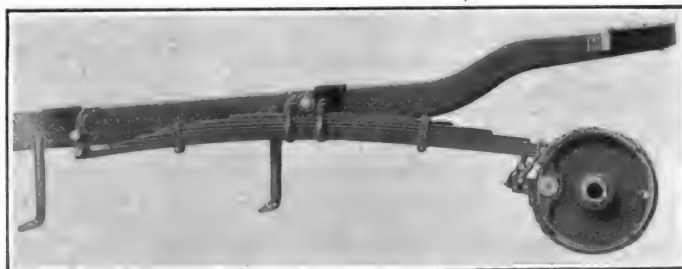
With the records that we have we are able to render owners of cars the most complete service possible. It would only be necessary for you to get in touch with us by letter, by wire, or by telephone, and tell us the name of your car, the model, the year in which it was made and the location of the part that you wish replaced. That would be all the information we would need to supply you with exactly the bearing needed, and we could get this bearing off to you immediately. Its receipt would not require any longer than for the shipment to get from our nearest branch to you.

We do not know of any collection of data like this in the world. It has been a

monumental task to compile it, but it has been accomplished in large measure through the co-operation of the Hyatt Roller Bearing Company, the Timken Roller Bearing Company and the New Departure Manufacturing Company, who have contracted with us to handle their service operations. We feel that our efforts will be appreciated by the thousands of motor car owners.

NEW TYPE OF GASOLINE ENGINE SHOWN IN DETROIT.

George F. Moore of Evansville, Ind., inventor of the "Recip-roto" gasoline engine, recently gave a demonstration of his machine at the Hotel Statler in Detroit. He claims the engine combines the elements of both the reciprocating and rotating types and will on one-fourth



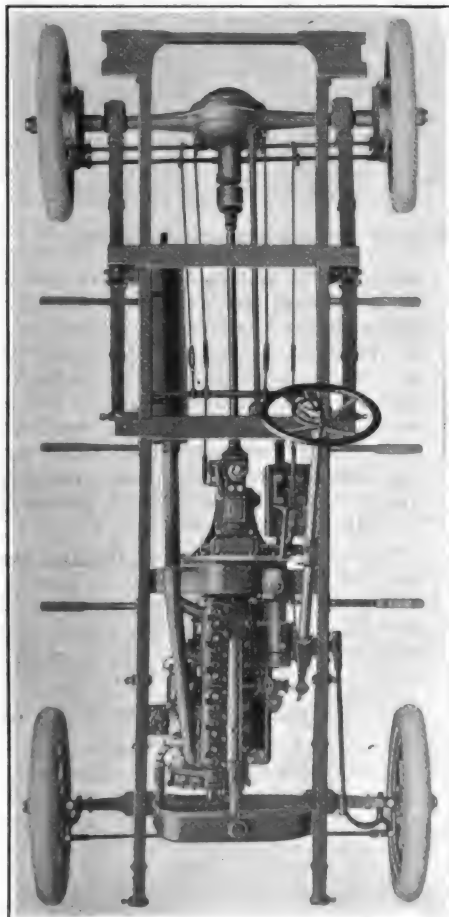
52-Inch Cantilever Rear Spring.

the fuel develop as much power as the reciprocating engine of the same horsepower. It has no flywheel or piston and one-eighth the number of parts of a reciprocating engine.

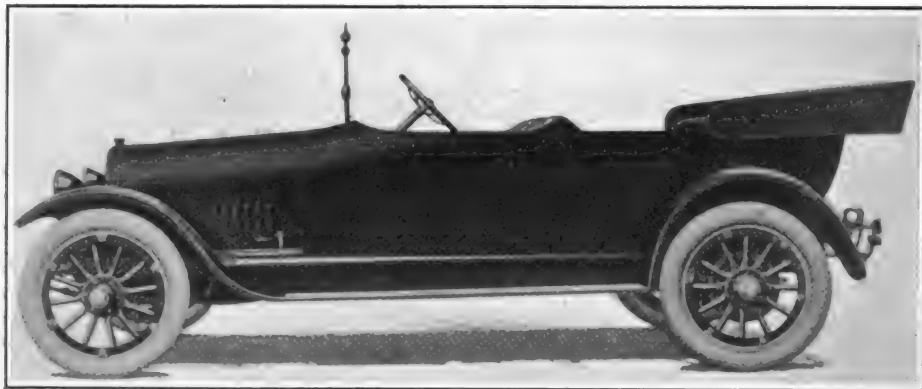
SHOW OLDS CARS AT DRUG EXPOSITION.

The Olds Motor Works of Lansing, Mich., entered a complete showing of its cars in the National Food Drug and Chemical Exposition at the Chicago coliseum, which was held during the week of Dec. 4-10.

A roadster especially adapted for physicians was the feature of the exhibit and the company made it a point to call the attention of physicians to it by issuing special invitations with admission tickets among several thousand doctors in Chicago and vicinity. The response was very satisfactory, in fact, beyond the expectations of the Olds company.



The Rugged Yet Light Chassis of the Pilot Six-Forty-Five.



Auburn Seven-Passenger 6-44 Touring Car.

Auburn To Make 1917 Season, 41 H. P. Engine,

Lubrication is by two individual systems, the main bearings being supplied by a plunger driven pump located near the end of the engine on the right side. The other working parts are lubricated by the Teetor patented splash system, which consists of two large reservoirs, one in the front half and the other in the rear half of the under pan, each reservoir having holes large enough to admit a certain quantity of oil. A splash pin on the under side of the connecting rod cap passes through the oil and in so doing lubricates the rod bearing and throws an excess to the camshaft bearing and the cylinder walls. In returning to the main oil reservoirs the oil eventually seeps into pockets in each of the crankshaft bearing brackets, thereby insuring double protection for the vital working parts.

Cooling is cared for by a centrifugal

FOR the 1917 season the Auburn Automobile Company, Auburn, Ind., is manufacturing two models, both Sixes. The Light Six, designated as model 6-39, lists at \$1085, either as a five-passenger touring car, a four-passenger Tete-Tete roadster or as a two-passenger roadster. Both the four and the five-passenger models are equipped with detachable sedan tops for \$175 extra. The other Six, model 6-44, lists at \$1535, either as a seven-passenger touring car or four-passenger Tete-Tete roadster. The sedan top on this chassis is \$250 extra.

The bodies on the new model chassis surpass even their attractive predecessors of last year. They appear to be very roomy and apparently no detail of finish has been overlooked. The exterior lines are unusually graceful and conform to the latest tendencies of stream lines. The sides are higher and the hood line long and gently sloped and in perfect harmony with the general lines of the car.

39 to 41 H. P. Power Plant.

The engine in the 6-39 model chassis is an L head, six-cylinder block casting, with bore of $3\frac{1}{4}$ inches and stroke of five and piston displacement of 230.1 cubic inches. According to S. A. E. rating it develops 23.44 horsepower and on brake test 39 to 41. The engine is in unit with the clutch and gearset and has three-point suspension. The cylinder head, which is detachable, is cast in two parts, which makes for convenience in dismantling and assembling and insures a tight joint at the head gasket.

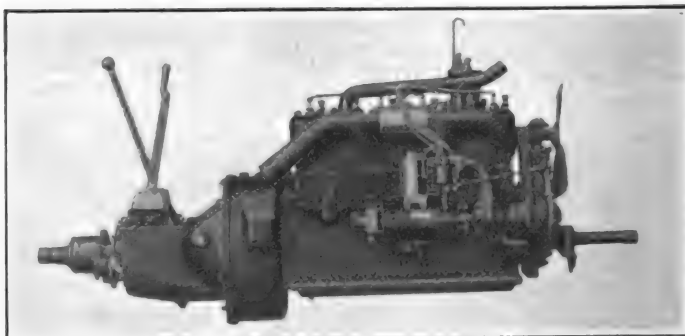
Three main engine bearings are used on the crankshaft, and a like number on

the camshaft, all of which are made of the highest grade babbit, die cast. A notable feature of the connecting rod assembly is that the wrist pins are retained in a fixed position by a clamp bolt, which prevents the cylinder walls being scored should the bolt become loosened. This construction also provides more bearing surface for the pin than in ordinary construction.

Interchangeable Valves Used.

On the cast iron pistons used are three rings, these having recessed skirts, which act as scrapers to prevent excessive amounts of oil reaching the combustion chamber. Timing gears are helically cut and the valves are interchangeable and adjustable.

The usual type of push rod or valve lifter has been replaced in the Auburn model by small light lever arms, which are carried on a shaft provided for same, and this shaft is mounted on a plate which forms a part of the valve housing cover. The lower side of the lever arm rides on the cam at the end opposite the supporting shaft, while the lower end of the valve stem rides on the upper side of the arm. In this way there are no walls between the crank case and the valve housings to interfere with lubrication of the valve mechanism.



Right Hand Side of Auburn Unit Power Plant.

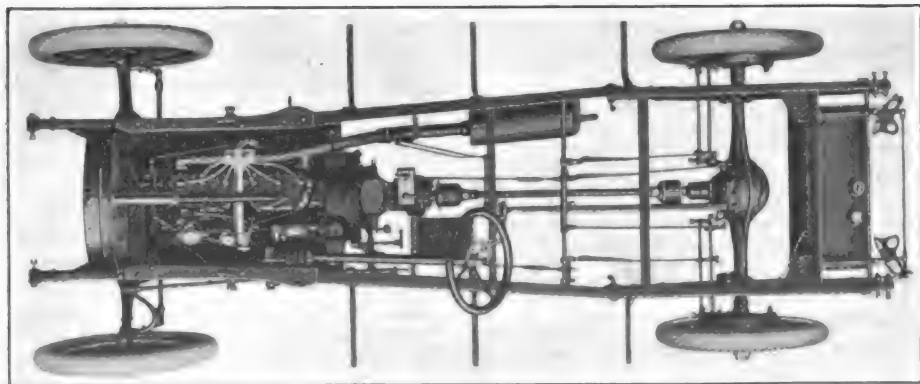
pump, which is located on the right side of the engine and delivers water at the centre of the engine block directly under the exhaust ports. The same shaft that drives the water pump operates the generator and ignition equipment. The carburetor, a Rayfield, is located on the left side of the block, and the intake manifold passes in a direct line through the cylinder water jacket, which assists materially in carburetion.

The electric current for starting, lighting and ignition is created by generator driven by pump shaft and stored in storage battery. The starting motor pinion meshes with a hardened ring gear on the rim of the flywheel.

Direct Drive on High.

A dry plate disc type clutch is employed. The transmission gearset is of the selective sliding type, three speeds forward and reverse, with direct drive on high gear. Annular ball bearings are used throughout. Drive from the gearset to the floating rear axle is by propeller shaft through double universal joints.

The rear springs are of the cantilever design and the front of the semi-elliptic



Stripped Chassis of the Six-Cylinder 6-44.

Two Sixes During One Having A The Other 45 H. P.

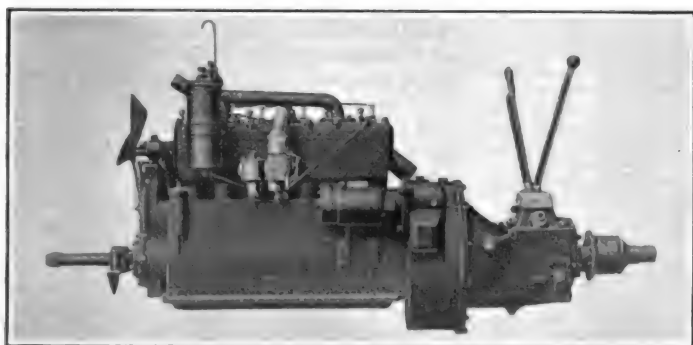
type. The brakes are of the conventional external contracting and internal expanding type, and are equipped with equalizers and springs to prevent dragging.

Twelve-spoke wood wheels are used front and rear, and they carry quick demountable rims and 34 by four Goodrich straight side tires as standard. The wheelbase of model 6-39 is 120 inches and the road clearance 10½ inches.

Steering Gear Semi-Reversible.

The steering gear is worm and nut, semi-reversible, with the steering column at the left hand. The gear shift and emergency brake levers are at the centre.

The engine of the Auburn 6-44 has six 3½ by 5¼ cylinders, cast in block, with an S. A. E. rating of 29.4 and brake test



Left Hand Side of 6-39 Auburn Engine, Rated at 41 H. P.

rating of 45 horsepower. The valves are all enclosed and operated by a single cam shaft on one side of the block. The push rods are of the mushroom type, and the crankshaft is carried on three main bearings of liberal size.

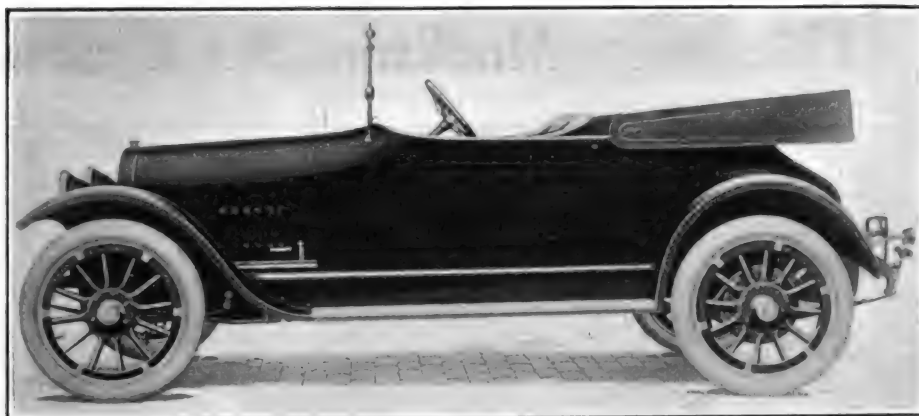
Lubrication is by a combination force feed and splash system, a horizontal plunger pump being driven by an eccentric from the camshaft. Cooling is by a gear driven, centrifugal pump bolted to crank case. The fan is driven by laminated linked V belt from pump shaft.

20-Gallon Fuel Tank at Rear.

Carburetion is by an automatic float feed instrument placed on the side opposite to the valves and equipped with hot air fitment and hot water jacket. Fuel is fed by vacuum from a 20-gallon tank on extended frame members at the rear of chassis.

The electrical system embraces combined generator ignition and starter. It is a one-unit, six-volt system.

The power plant is in unit, including the engine, a dry plate disc clutch and a three-speed, selective transmission gear-set in which annular ball bearings are used. The drive is from transmission to



The Auburn Tete-Tete 6-39 Roadster Model.

the floating rear axle by propeller shaft fitted with two universal joints, torsional strain being obviated by use of cast steel torsion arm, the forward end of which is spring mounted.

Cantilever Springs at Rear.

The frame is suspended on cantilever springs at the rear and semi-elliptic springs at the front. The brake equipment on the 6-44 model is similar to that described for the 6-39 chassis, as is the steering gear, location of controls and steering column, and wheel equipment, except that the tires are 35 by 4½ inches in dimensions. The wheelbase of this model is 131 inches, with road clearance of 10½ inches.

The bodies on both touring models have four full flush U doors, with invisible hinges and latch handles flush with inside of door. The tonneau floors are carpeted and driver's compartment floor covered with linoleum, aluminum trimmed. The rear doors have capacious pockets. The "Tete-Tete" roadster on both chassis have divided front seats and roomy luggage space. The two-passenger roadster which is mounted on the 6-39 chassis only, also has luggage space, and the rear deck is sloping. The door on the right hand side is fitted with a

lock, this being a feature that will be appreciated.

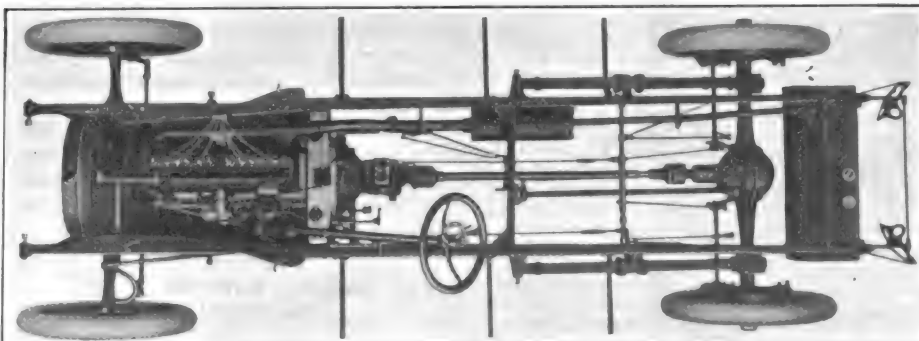
All points considered, both as regards mechanism and bodies, these Auburn models promise to be the most popular yet turned out by the company.

GULF REFINING COMPANY OPENS SERVICE STATIONS.

The Gulf Refining Company is installing a number of modern type service stations along the Lincoln Highway in Pennsylvania and at other points. Three of these stations are maintained in the city of Pittsburg, two in Philadelphia and one in Atlantic City, N. J. They are built along similar architectural lines and a general color scheme is observed. They are six sided in form with a drive way encircling the station. From 10 to 13 pumps of the large five-gallon delivery size are installed at each station and from eight to 12 uniformed attendants are on duty at all times. The service is maintained throughout the day and night and every possible courtesy is extended to patrons. The employees attending these stations are not allowed to receive tips or gratuities, a fact which is featured in the company's advertising.

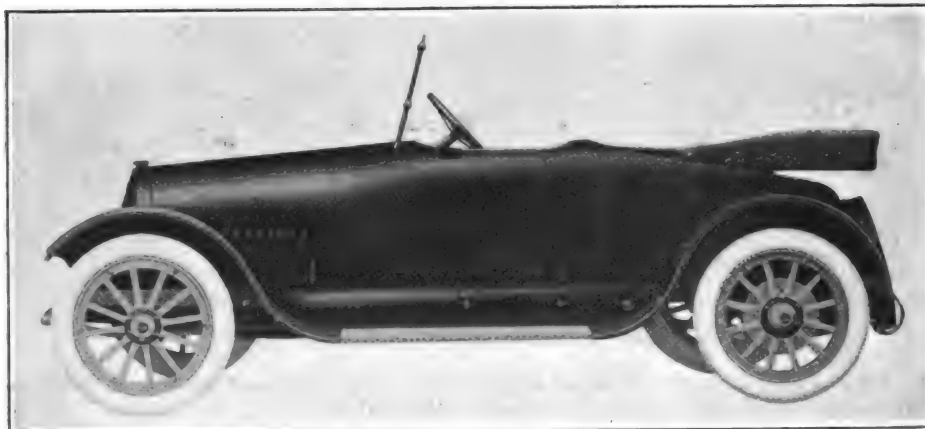
MECHANICIAN KILLED AT PHOENIX, ARIZONA.

Drennan of Oklahoma City, who was acting as mechanic for H. B. Armington during a 100-mile race at the state fair grounds in Phoenix, Ariz., met almost instant death when the car in which he was riding struck the fence surrounding the course.



Stripped Chassis of the Auburn 6-39 Model.

The Dolly Madison Six-Cylinder Roadster.



Dolly Madison Six-Cylinder Roadster.

The four-passenger, six-cylinder Dolly Madison roadster just announced by the Madison Motors Corporation, Anderson, Ind., makes five models in the present series of Madison cars, all six-cylinder "jobs," and ranging in price from \$1050 to \$1250. The new roadster sells for \$1150 f. o. b. factory. Its wheelbase is 120 inches and it has a 40 horsepower Rutenber, 3½ by five-inch engine. Other features are the Remy electric starting and lighting installation and the floating rear axle with Brown-Lipe nickel steel spiral gears. The wheel equipment includes 34 by four-inch tires, rough tread on the rear set. The body is painted in mouse gray and has black fenders and red wheels.

DISCUSS RAILWAY CROSSINGS.

Propositions Made by Railway Representatives To Guard Grade Crossings Against Accidents.

At the conference of representatives of the National Association of Railway Commissioners, the American Automobile Association and the American Railway Association, the subject of railroad crossings at grade and signals for warning vehicular traffic at those points was the principal topic of discussion.

The purpose of the conference was to secure the country wide adoption of uniform systems for signaling at grade crossings. It was the unanimous opinion that the first warning sign to be erected by a city, town or county should be located not less than 300 feet from a crossing, but as to where and by what means a "full stop" signal should be displayed there seemed to be no unanimity of ideas.

The chairman of the A. A. A. legislative board, Osborne I. Yellott, gives the following account of the results:

It was realized by the A. A. A. representatives, who included President H. M. Rowe, that while the number of accidents at grade crossings was almost infinitesimally small in comparison with the number of such crossings made safely by motorists during the course of a year, nevertheless, some steps should be taken to minimize accidents to the smallest possible degree. Two propositions were suggested by the spokesmen of the railroads: the first providing that within 100 feet of the crossing the motor vehicles should not proceed at a rate of speed greater than 10 miles per hour; and the second that the motor vehicle should be brought to a full stop not less than 10 feet from the nearest rail of the crossing.

The first suggestion was objected to on the ground that it was unreasonable and would tend to give rise to the maintenance of obnoxious speed traps at such crossings, with resulting inconvenience and injustice to many motorists who were, in fact, exercising proper caution in approaching the crossings in question. The second was objected to mainly on the ground that it was unreasonable to

require motorists to stop at all crossings regardless, since in many instances the tracks in either direction are visible for such distances as to make stopping entirely unnecessary. It was finally agreed that motorists should be required to reduce speed and proceed cautiously at all crossings, and that the Public Service Commissions or Railroad Commissions of the several states should have the power to determine the crossings at which it was reasonably necessary that stops be made; such full stop crossings to be designated by appropriate signs, and the failure of a motorist to stop at such to be prima facie evidence that he had not proceeded cautiously in making such crossing.

In making this latter concession the representatives of the motorists realized that there are some grade crossings at which ordinary prudence requires a full stop, and that inasmuch as conditions vary so much at this class of crossing, it would be better to leave the determination of such to responsible bodies, such as public service commissions.

In a subsequent general gathering of the National Association of Railway Commissioners, the proposed bill tentatively agreed upon by the participants at the conference was not adopted, but they approved the seven propositions put forward in resolutions adopted in Chicago last June by the special grade crossings committee of the American Railway Association and a similar committee from the Railway Commissioners.

Chairman Yellott, in speaking for the motorists' organization, infers that the full stop proposal will be opposed unless it is adopted under the plan which he has set forth.

NINTH ANNUAL WINTON CHAUFFEURS' CONTEST.

George Felt of Minneapolis, chauffeur for H. D. McCord, won the first prize of

\$500 in the ninth annual Winton contest for employed chauffeurs. The judges in the contest, which is conducted by the Winton company of Cleveland, O., met recently and awarded the \$3500 prize money.

The second prize of \$400 was won by William C. Ball, chauffeur for F. F. Rowe of Kalamazoo, Mich. The third award of \$300 was won by Alfred Shibley, chauffeur for J. W. Lloyd of Pittsburg, Penn., and the fourth award of \$200 went to W. M. Newsome, chauffeur for M. R. Hirsch of Atlanta, Ga.

Awards of \$100 each were also made to the following, the name of the chauffeur appearing before his employer:

A. H. Klein, S. J. Wilkins, Chicago; Ralph H. Lee, S. J. Franklin, Millville, N. J.; G. M. Lewis, E. R. Caldwell, Syracuse; Henry Belanger, Mrs. D. B. Curtis, Manchester, N. H.; Geo. T. Macone, F. E. Cour- sen, Stockbridge, Mass.; Thos. Murren, J. M. Anderson, Boston; Jos. Castellucci, Mrs. M. E. Bearse, West Medford, Mass.; Edw. M. Armstrong, C. M. Goodnow, Boston; Robt. Clements, F. H. Jones, Andover, Mass.; P. O. Hale, A. P. Friend, West Newton, Mass.; F. H. Coyston, W. L. Porter, Pittsburg; T. L. Quigley, J. J. Flanagan, Elmira, N. Y.; Herbert Lewis, Geo. Spottiswode, Orange, N. J.; Chris. McDermott, Robert Fraser, Utica, N. Y.; P. J. Farrington, M. H. Hellman, Los Angeles; Chas. Schmidt, Thos. Lonergan, St. Louis; W. Desillier, Allen Arnold, Swampscott, Mass.; W. L. Woods, Miss H. J. Silver, Brooklyn; A. P. Holst, Mrs. John Sexton, Chicago; E. P. Carey, Wm. de la Barre, Minneapolis; Albert Hitchen, C. W. Tabor, Los Angeles.

The total mileage covered by these 25 chauffeurs during the contest was 290,426.7, at an average expense of \$5.90 for repairs.

The grand totals for the entire period during which contests have been conducted and in which thousands of drivers of Winton cars have participated, are as follows:

Number of cars that traveled	
5000 miles or more each.....	536
Total mileage made by these cars	5,509,049.3
Average miles per car.....	10,278
Total repair expense for all cars	\$5,640.64
Average repair expense per car	10.52
Average repair expense per car per 1000 miles.....	\$1.03

Women Favor These Coats.



Utility, as well as smartness, is the keynote of this outfit. The coat is of suede, and the hat and hand bag are made to match.
(From Brill Bros., N. Y.)

The very appearance of this coat indicates the warmth all motorists desire for winter driving. It is of racoon, as is the hat.
(From Lamson & Hubbard, Boston.)

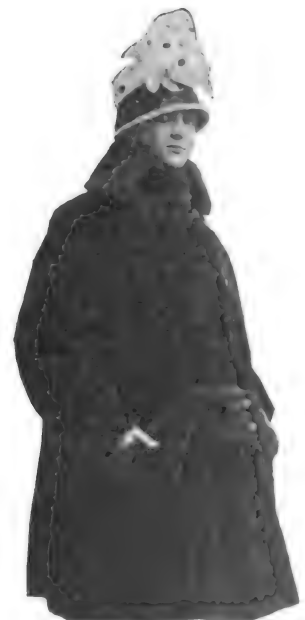


At the left is a sable coat with huge cape collar, which may lay flat or be rolled up high. Note treatment of fur in the borders.
(From Revillon Freres, N. Y.)



This striking garment is of skaterap and is cut along distinctive lines. It is a motor and street coat that will appeal to all women motorists.
(Bergdorf & Goodman, N. Y.)

Beaver fur is very popular this year. The coat below is distinctive because of waistline belt and pockets and collar. (Lamson & Hubbard, Boston.)



Photographs by Joel Feder, New York.

BIG ASSOCIATION IN GEORGIA.

Plans Are Under Way for Organization Whose Slogan Is "Good Roads For Georgia."

Plans are under way for the organization of the Georgia State Automobile Association which is to be a big factor in road betterment throughout that state. The Atlanta Automobile Club, recently organized with the official slogan of "Good Roads for Georgia," will be one of the main factors in the state organization and steps have been taken for the formation of similar associations in Savannah, Macon and other cities in the state, which will become affiliated with the parent association.

It is figured that in addition to the great aid the association will render in improving the road system throughout the state it will also result in an annual reduction of 15 to 30 per cent. in the cost of automobile insurance to members.

AMERICAN SPEEDWAYS ASSOCIATION ORGANIZED.

At a meeting of the managers and officers of the various automobile speedways in the country, the American Speedways Association was organized. The objects of the organization are to promote automobile racing throughout the United States and create a stronger public interest in the sport.

The officers of the organization are: Harry S. Harkness of New York, president; James A. Allison of Indianapolis, vice president; T. E. Meyers of Indianapolis, secretary; class A (two-mile speedways), governors: James A. Allison, Harry S. Harkness, H. S. Ishmann of Cincinnati and D. F. Reid of Chicago; class B (speedways of less than two miles), governors: C. W. Johnson of Uniontown, Penn.; F. Perkins of Providence, R. I., and Samuel Orloff of Des Moines, Ia. T. E. Meyers, D. F. Reid of Chicago and Harry F. Harkness form the executive committee.

BRIDGEPORT, CONN., AUTOMOBILE SHOW.

The automobile show at Bridgeport, Conn., which will be held Feb. 19-24, will be staged in two separate buildings with the main section in the State Armory. A floor space of over 30,000 square feet will be devoted to the exhibition, which is being held under the auspices of City Battalion Coast Artillery Corps. B. B. Steiber is manager.

EMPIRE ANNOUNCES NEW CONVERTIBLE SEDAN TYPE.

A new convertible sedan type has been announced by the Empire Automobile Company, Indianapolis, Ind., as the latest addition to its line, and deliveries will be started immediately. There are

but two doors in the coach part of the car, one on each side, about midway between the rear and front. They open into the interior of the rear compartment, the parlor type individual seats being reached by an aisle way. The inside is beautifully upholstered and equipped with all the latest devices to afford comfort and convenience to the occupants.

It is mounted on the Empire six-cylinder chassis with a 120-inch wheelbase.

LINCOLN HIGHWAY TRIBUTARY IN UTAH.

The Arrowhead Trail in Utah, which runs through one of the most picturesque sections of the country and along the route of the old "Mormon Path," has been opened to traffic and is one of the latest tributaries to the Lincoln Highway. Charles A. Bigelow, the engineer in charge of construction, who supervised the work of reclaiming much of the land over which the route passes, recently made a tour over this tributary from St. Bernardino, Cal., to Salt Lake City.

DIRECTORY OF MAGAZINES AND NEWSPAPERS.

The H. W. Kastor & Sons, advertising company of Chicago and St. Louis, is publishing a complete directory of the newspapers and magazines issued in the United States and Canada. In addition to the names, addresses and classification of the publishers, circulation figures are given and also the population figures of the different towns, cities and states.

The book, while containing 700 pages, will be neat in form and easy to handle. Copies, which will be ready by the first of the year, will sell for \$2 each. Copies can be reserved in advance of publication by sending check for the amount.

"FACTS ABOUT GEARS" BY VAN DORN & DUTTON.

The Van Dorn & Dutton Co., specialist in gears and gear cutting, has issued a booklet entitled "Facts About Gears," which gives a technical treatise of that subject.

Some of the space is devoted to views of the various departments of the company's plant, but it is mainly devoted to a description of the processes of gear manufacture and also includes valuable tabulated data on gearing terms, drawings and specifications and formulae for every type of gearing.

A copy will be sent free upon application to the main office of the company at Cleveland, O.

PITTSFIELD AUTO SHOW FOR NEXT FEBRUARY.

The second annual automobile show held under the auspices of the Company F, Second Massachusetts Regiment, in the State Armory in Pittsfield, Mass., will be held during the week of Feb. 19. James J. Callahan, who managed the show last year, will again have charge of the exhibition.

The annual banquet of the National Automobile Chamber of Commerce will be held at the Waldorf-Astoria on the evening of Jan. 9, during the week of the automobile show in New York.

The Mitchell Motors Company, Inc., of Racine, Wis., has announced an increase in the price of the Mitchell and the Mitchell Junior of \$100, which became effective on Dec. 1.

COMING EVENTS

December.

Show, Akron, O. Dec. 9-16
Race (Speedway), Los Angeles. Dec. 25
Show, Cleveland, O. Dec. 30-Jan. 6

January.

Show, New York City. Jan. 6-13
Banquet, N. A. C. C., New York City, Waldorf-Astoria Hotel. Jan. 9
Convention, S. A. E., Mid-Winter Meeting at New York City. Jan. 9-11
Show, Cleveland, O. Jan. 13-20
Show, Fall River, Mass. Jan. 15-20
Show, Montreal, Que. Jan. 20-27
Show, Rochester, N. Y. Jan. 22-27
Show, Oklahoma City, Okla. Jan. 22-27
Show, Buffalo, N. Y. Jan. 22-27
Show, Chicago. Jan. 27-Feb. 3
Show, Wilmington, Del. Jan. 29-Feb. 3

February.

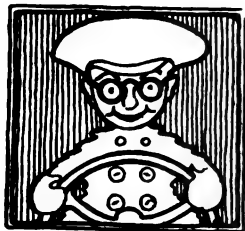
Show, Minneapolis, Minn. Feb. 3-10
Show, San Francisco. Feb. 10-18
Show, Kansas City, Mo. Feb. 12-17
Show, St. Louis. Feb. 18-25
Show, Duluth, Minn. Feb. 19-24
Show, Des Moines, Ia. Feb. 19-24
Show, Bridgeport, Conn. Feb. 19-24
Show, Pittsfield, Mass. Feb. 19-24
Show, Wilkes-Barre, Penn. Feb. 26-Mar. 3
Show, Omaha, Neb. Feb. 26-March 3
Show, Newark, N. J. Feb.

March.

Show, Boston, Mass. March 3-10
Show, Fort Dodge, Ia. March 6-10

April.

Race (Road), Los Angeles to Salt Lake City. April



Graphic Items



A Detroit plumber is bemoaning his lack of faith in the future of the automobile industry. It was not many years ago that he secured an \$18,000 contract



from one of the automobile manufacturing concerns and at the time was asked to take stock in the company as part payment for his work. The stock was not selling very high at the time and the plumber thought he was acting wisely in taking the cash, but a turn for the better came about in the finances of the automobile company and if he had taken the stock offered he would at present have a profit of some \$350,000 instead of the comparatively small sum he was able to make from the \$18,000 contract.

A veterinary surgeon in New Jersey in filing his application for bankruptcy, stated that neither his profession or the livery stable which he conducted were remunerative any longer owing to the inroads made on the business by the general adoption of the automobiles in so many different lines of business. His livery business, particularly, he states, was adversely affected by the use of automobile hearses and motor cars at funerals.

The most extraordinary claim ever received by a motor car maker was that which recently came into the service department of the Kissel Motor Car Company. The owner of the machine wanted a new tonneau carpet to replace the one that had been eaten by moths during the first nine months he owned the car.

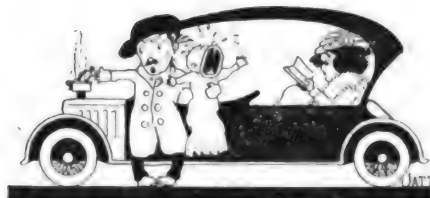
That the desire to speed is an irresistible impulse with most motorists is the conclusion drawn by authorities of Fresno county, Cal., who have abandoned the experiment of putting automobilists on their honor while in that county. Large signs were erected on the roads leading into the county, reading, "You Are on Your Honor in Fresno County."



These signs were erected two years ago largely at the request of motor car dealers, but the road officials soon learned that there was a different code of honor existing regarding the speed laws than the other statutes and were obliged to resort to arrests and fines to keep the speeders from "burning up the macadam."

The officials of the Pennsylvania and New Jersey joint free bridge commission are preparing to take action in freeing toll bridges. They will first take up the matter in connection with the bridge on the Lincoln Highway that spans the Delaware.

Hardly a day passes without a new development of one of the many latent possibilities of the motor car. The latest that is being quite generally employed by the parents of small babies who are being brought up on the bottle is the use of the radiator as a means of furnishing heat for its food. On long tours, where the baby was to be fed every few



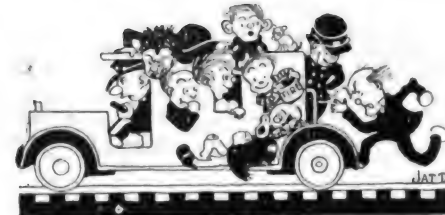
hours, a deep tin cup is carried along and when it becomes feeding time, steaming hot water is drawn from the radiator into the cup and the bottle is placed in the water until sufficiently heated.

Charges and counter charges flew thick and fast out in Augusta, Kan., when a mob broke into the jail to liberate some of the leading citizens who had been incarcerated by an over zealous policeman in the act of enforcing the ordinance requiring that rear lights on automobiles be kept lighted after sunset. The angry citizens demanded the removal of the policeman who made the arrests, claiming that the town roads are so badly in need of repair that the consequent jolting makes it impossible to keep any lights burning.

It is estimated that 150,000 pairs of license tags will be required in 1917 to supply the motor cars registered in the State of New Jersey. The new plates will have a background of national blue with white numerals and letters.

The Pennsylvania and New Jersey railroad, which operates lines in the

northern section of New Jersey, will soon inaugurate a motor car service between several points. These cars will be specially constructed and will run on the



tracks used by the regular trains. This form of service is expected to be adopted by many roads on short hauls where only a few passengers are carried.

Antelopes are generally accredited with great speed and endurance, but the one that tried to escape a South Dakota citizen in a high powered automobile found his powers unequal to the task. The driver, an inhabitant of Rapid City, discovered the antelope alongside a road and gave chase. The animal stuck to the highway and ran for six miles, the motor car following close behind at a rate of 50 miles per hour, until the antelope fell over, exhausted.

The following letter was received by the Elgin Motor Car Corporation of Chicago. "Dear Sirs: I see in The Automobile Journal there is talks of the Publick wonting a change in the automobile engines. I have been figering on a auto Engin for the last two years, so I think I can make quite a impruveant on the four cydern engin and sean you are a company I thot you mite want me. I have don quite a lot of expermental work in my tim, althoe I am no Graduated, neither was Edison, McCormic or Wistienhous, althoe I do not compair my self with those men, althoe I ant so slow when it comes to a test. (Signed) "Harold Jones."

A New Yorker, facetiously inclined, recently sought revenge on the police court for fining him for over speeding by paying the fine in dimes, quarters and nickels. As usual, the court failed to see the point of his joke and instead of \$25



he was assessed \$30. The extra five would probably not have been tacked onto the original fine had he not tried to pass off several foreign coins in the collection of silver and to indiscreetly mention that he wished he had \$25 in pennies.

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The "Goodyear Silents," a football team composed of deaf mutes in the employ of the Goodyear Tire & Rubber Company, holds a conspicuous position in sporting circles in Akron, O. While operated under considerable difficulty in



giving and receiving signals, they have given a very good account of themselves during the present season.

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An Illinois cattle dealer has found a new use for his motor car at night. He found that if he turned his searchlight on the road ahead of his droves the cattle would invariably follow the highway without wandering and would move along much quicker.

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Being fined for backing one's car faster than the speed limit is an unusual experience. A Vermont truck driver fell afoul of the law in this respect and had to pay quite a large fine, the court basing its action on the fact that a car or truck is then much less under control than when driving forward.

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Now comes the "spirited" automobile, reported from Hutchinson, Kan., where all spirits confiscated by the authorities are going to be used to put "pep" into motor cars, according to a rumor. Kansans are eagerly anticipating a glimpse



of the first car that runs through the town propelled by spirits fermenti.

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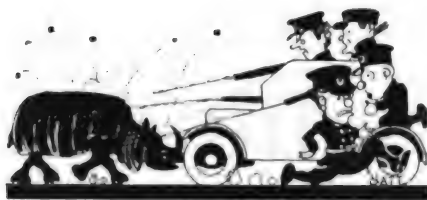
Of a total of 759 automobiles imported into Java for the first six months of this year, 668 came from this country, 53 from Italy and 32 from the Netherlands.

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The State of Illinois is traversed by 44 motor car trails.

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The Germans met their match in the British "tanks" at the battle of Combes, and the impression was created broadcast that these machines were invulnerable. Later advices, coming from the scene of British activities in South



Africa, indicate the contrary. In this case it was the tank that met its Waterloo—met it shortly after meeting a very thick skinned rhinoceros which charged the machine despite a stream of bullets from the machine gun, and overturned the five-ton machine. It retreated to the jungle in orderly fashion after conquering the car.

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F. L. Lane, secretary of the interior, has received a protest from an organization in California, it is claimed, that the motorists of that state pay more than \$2,000,000 annually as state license in addition to an ad valorem tax and that in view of this heavy assessment the tax of \$5 imposed on each car entering Yosemite National Park is unjust.

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Mabel Normand, the movie star, is so fastidious that even the highest salaried car designer could not create a body for her car that would suit her capricious



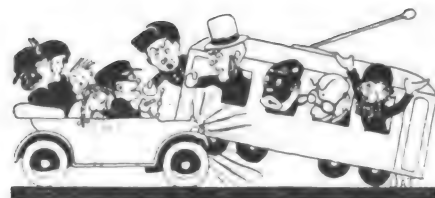
temperament. She therefore did the next best thing, and designed the body for her roadster herself and included in it a very novel "make-up" arrangement, including a good sized mirror and all the "utensils" that go with a regular theatrical kit. Now when she requires a quick change of complexion she seats herself upon the running board and proceeds to make up with all the essentials to that process at her finger tips.

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The Canadian Ford company, Ford, Ont., has a complete moving picture department. Films are taken of any happening of general interest, but particular stress is laid upon scenes that link the Ford car with the public mind (and, eventually, pocket book).

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The old conundrum about the result of a collision between an irresistible force and an immovable object found an answer in a peculiar accident which happened in Juanita, Cal. A Mitchell touring car, going at the rate of 10 odd miles



per hour, met in head-on collision with a street car, and contrary to what would be generally supposed, the machine remained in its tracks while the electric car careened to one side, one end going up on the sidewalk and ending up close to the entrance of a store.

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A dead mule and an injured motor car constitute the bone of contention in a legal battle that was recently fought in a New Hampshire court. The man who owned the mule, before it became a carcass, wanted \$200 damages, claiming the owner of a motor car ran into the ani-



mal. The owner of the car asks for similar restitution for the damage done to his machine when the mule struck it. It was plain in the evidence that the machine hit the mule head on as had the rear end come in violent contact with the car the result and fatality list would have read differently.

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The farmer is rapidly falling under the spell of the gasoline fever, but few cases are on record as of that of a Croyden, N. H., agriculturist, who traded the majority of his worldly goods for a second-hand car. It was turned over on receipt of the following articles: 16 Yorkshire pigs, two cows, three calves, one horse hoe, two horses, three heifers, one horse rake and one 1915 cultivator.

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A decision has been given by the State Banking Board of North Dakota prohibiting state banks and trust companies from carrying automobiles on their books as part of the assets.

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The invincibility of Chanticleer is well known in the Edmund Rostand's legend



of the barnyard, whereby hangs a tale. A rooster of equal temerity, constituting the sole stock and store of a Manila naval officer's poultry yard, had strutted about his undisputed dominion without ever having his valor contested until one day the owner ran his highly polished runabout into the hen yard to park it over night. Shortly after sun rise the lone rooster spied his image reflected in the polished door panel of the car, whereupon he immediately flew to battle, working his spurs and beak with a staccato rhythm against his reflection. Honors were even, but the car panel needed refinishing to be in keeping with the immaculate polish that graces the rest of the body.



Accessories and Equipment



FITZGERALD GASKETS.

The Fitzgerald ready-to-attach gaskets are designed to simplify the operation of fitting gaskets, to insure a perfect fit and to economize in the amount of time and labor generally spent in fitting home-made ones. They are cut and trimmed to fit exactly on any car for which they are intended. At present they are obtainable for Fords, Vims, Dodges, Monroes, Engers, Oaklands, Maxwells, Chevrolets and Overland models 75 and 83. These gaskets make excellent equipment for any garage or repair shop and should be investigated.

Made by the Fitzgerald Manufacturing Company, Torrington, Conn. Write for prices.

EMERGENCY AXLE STUB.

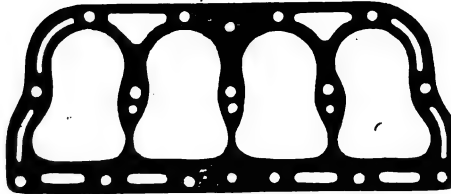
With this device the Ford car in case of broken axle shaft can be put on wheels in a very few minutes and towed into the nearest garage at a good rate of speed with a minimum loss of time. It is so constructed that it merely hooks under the flange on the axle housing and has a set screw on top which when screwed down holds the device firmly in place on the axle housing. The device known as No. 1 is made to take the Ford axle cones and a Ford front wheel is used. The type known as the rear axle device is the same as this except that it has a tapered stub to take the rear wheel. In this case installation is accomplished by removing the broken axle from the wheel hub and putting the wheel on the stub.

Made by the Ekern Bros. Manufacturing Company, Flandreau, S. D. Price, \$5.

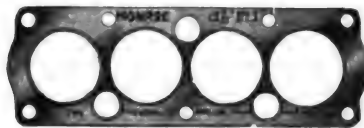
SOCKET WRENCH SET.

A set of socket wrenches with extension bars and universal joint to facilitate getting at inaccessible nuts has been introduced to the trade. This outfit consists, in detail, of an all steel ratchet wrench, a steel extension bar, an offset wrench handle, a drop forged universal joint, 30 pressed steel sockets, of which seven are square and 23 hexagonal, and a double end spark plug socket, fitting standard plugs. This outfit complete as described is called Champion No. 10 and is furnished in a strong, finely finished wooden box to keep the outfit together and also to make it easy to carry about.

Made by the Syracuse Wrench Company, Syracuse, N. Y. Price, \$10.00.



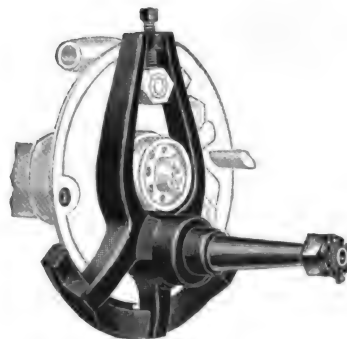
Fitzgerald Ready-to-Attach Gasket for Overland 75.



The Type of Gasket Supplied for the Munroe Car.



The Ready-to-Attach Type Designed for Vim Cars.



Emergency Axle Stub.



Champion No. 10 Wrench Set of the Socket Type.

EVER-TIGHT PISTON RINGS.

The Ever-Tight piston ring, because of its unusual, but scientific construction, is said to absolutely prevent leakage, to fit any cylinder, however badly it is worn, practically eliminate carbon trouble and reduce maintenance cost. The chief feature of this ring is its three-piece construction, the three separate parts being grooved together by the ring's right angle interlock. Engine builders and engineers are agreed that this principle of locking is the best for safety and prevention of leakage. Because of the construction, the rings fit tightly without binding and, because they are exceedingly flexible, friction is reduced to the minimum, increasing the horsepower 15 per cent. and reducing the heat, wear and tear. Everywhere these piston rings have been used they give unqualified satisfaction. The maker is conducting a big national campaign of education among motorists.

Marketed by the Ever-Tight Piston Ring Company, 1423 Chestnut street, St. Louis, Mo. Write for prices.

STANDARD SPEEDOMETER.

An outstanding feature of the Standard speedometer for Ford cars is the imitation leather covered instrument board that comes as a component part of the equipment. This board is bored to receive the Standard 201-N speedometer and has two detachable metal ends that lay snug behind the ends of the cowl. Further insurance against vibration is secured through the use of a metal clip holding the board against the cowl top. Installation of the board is extremely simple and quickly done and accessories other than the speedometer can be easily installed. The Standard speedometer has a 4 1/4-inch nickel flange, black bezel ring and silver or black dial, and 10,000-mile odometer, 100-mile trip with quick reset. Two outfits are furnished in this type instrument, one with the same drive as was originally designed by the Ford Motor Company and another that has the Standard ball bearing, adjustable swivel joint drive. The latter type is necessary when shock absorbers are used on front springs. There also is a Standard outfit for Ford couplet and one for the Ford sedan.

Manufactured by the Standard Thermometer Company, 65 Shirley street, Boston, Mass. The first mentioned outfit sells for \$14; the ball bearing drive



Standard Speedometer and Board for Ford Cars.

type for \$15. Distributed by 50 sales and service stations, whose addresses will be furnished upon request to the maker.

TENOX LIQUID GASKET.

A new and highly efficient method of making air tight joints in engines and other parts of the chassis began with the introduction of Tenox Liquid Gasket. Thousands of repair men and owners of cars who make their own adjustments and repairs are now using it and indorse it highly. Tenox is a liquid that is applied to the faces of flanges or the parts to be joined, the application being done with a brush, in the manner paint is applied, and almost instantly the liquid congeals and makes a joint that is impervious to oil, heat, gasoline, water or vibration. It fills up every irregularity or crevice in the metals before hardening and when set will withstand any pressure to be found in present day gas engines. It is ideal for oil and water connections, a little bit on the threads making a perfectly air tight joint. Tenox replaces copper, asbestos, fibre and paper gaskets and is much more economical and satisfactory to use. Some of the largest car manufacturers in the world are using it every day and indorse it highly.

Marketed by the Tenox Products Company, 136 Liberty street, New York City. Prices range from 20 cents for $\frac{1}{8}$ pint to \$1 for a quart. A trial can, containing enough for almost any job, will be sent by the maker upon receipt of 30 cents.

AUTO BLOCK SIGNAL.

This device automatically indicates on its dial a dangerous condition of the engine, whether it is due to lack of oil, loose connection rods, too much carbon, scored cylinders, low supply of water or any other similar condition that might set the car afire. The Auto Block Signal has the faculty of instantly turning jet black when any trouble is about to occur, remaining red under normal conditions. Being attached to the head of the radiator it is always in plain view of the driver and is a constant reminder. The dial is on the driver's side of the device, while on the forward side one can have either a representation of the great seal of the United States, a fraternal emblem,

or a crest or monogram. This signal is not a worthless ornament, but one of great practical utility. It is $2\frac{3}{4}$ inches in diameter and $\frac{3}{4}$ inch thick.

Marketed by the Auto Block Signal Company, 1260 Continental and Commercial National Bank building, Chicago, Ill. Retail price, \$5.

TRANSMISSION BAND CLAMP.

This tool is designed to facilitate the replacement of the bands in the Ford transmission, saving, it is said, three-quarters of the time usually required for this troublesome operation. The bands

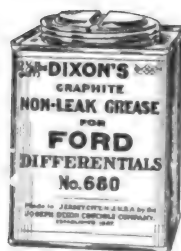


Dial Side of Auto Block Signal.



Transmission Band Clamp.

are held firmly around the drums, with the ears in perfect position to permit of slipping the three shafts in place as the cover goes down and the clamp is then removed through the small door in the transmission case cover. This eliminates the danger of injuring the felt gaskets in attempting to fit the shafts in place one at a time while pushing down the cover and insures against oil leaks caused by torn or turned over gaskets.

Can Holds $2\frac{1}{2}$ Pounds of Lubricant.

How Tenox Liquid Gasket Is Delivered.

Made by the N. Y. Motor Car Device Company, New York, N. Y. Price, 50 cents each.

NEW DIXON LUBRICANT.

Another Dixon special graphited lubricant has been added to the large line of lubricants for automobiles sold under the well known name of Dixon. It is designated as the Dixon's Non-Leak Grease No. 680, and already has found wide favor among owners of cars having leaky differentials. In cases where ordinary lubricants cannot be prevented from working out on the brake bands, No. 680 has been found to always effect a cure for that trouble, and for that reason is one of the best selling of all Dixon lubricants. For the benefit of owners of Fords and other small cars, No. 680 is now put up in $2\frac{1}{2}$ -pound tins.

Manufactured by the Joseph Dixon Crucible Company, Jersey City, N. J. Now carried in stock by nearly all dealers.

ELGIN MOTOR POWER.

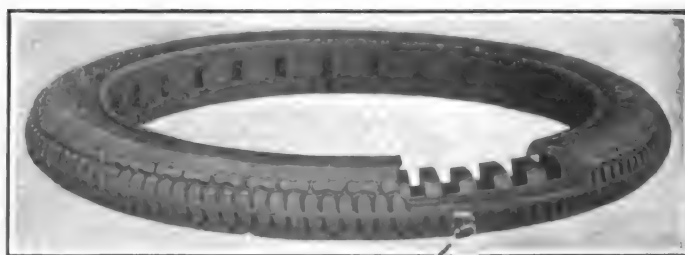
This is a preparation designed to be put into the fuel to give advantageous results. Among the claims for this article are that while it is non-injurious to the motor it increases power, mileage and efficiency. It allows a lower adjustment of the carburetor and tends to make the motor start easier. It keeps the spark plugs clean and softens and removes carbon. Its use reduces the cost of fuel 20 per cent.

Made by the Elgin Motor Power Manufacturing Company, Cedar Rapids, Iowa. Price, \$1.50 for one full can.

DAYTON AIRLESS TIRES.

Dayton airless tires, which are used on 75 per cent. of the motorized fire apparatus in the country and on many light commercial cars and Fords, have piers of live rubber set one inch apart throughout the inside of the tire cover, the piers supporting the weight of the vehicle and its load instead of by means of compressed air. When a small obstruction is passed over, the tires flatten out, giving a great range of resiliency. They are hand made and carry a written guarantee of 6000 miles of service. Dayton airless tires were invented in 1909 by John A. McMillan, and they have become so successful that the manufacturer is working 24 hours a day and has \$2,000,000 of contracts for 1917.

Manufactured by the Dayton Rubber Manufacturing Company, Dayton, O. Prices upon application.



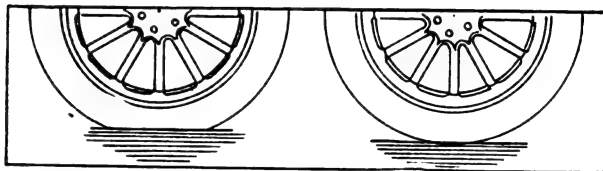
Dayton Airless Tire, Cutaway Section Showing Rubber Piers.

SUGGESTIONS FOR THE FORD CAR OWNER.

Putting on and Removing Tires from the Wheel Rims—How to Prevent "Freezing" and Destruction of the Casings and Tubes—Hints for General Care.

The 71st article dealing with the operation, construction, maintenance, care and repair of the model T Ford chassis is the 21st of the series devoted to adjustment, restoration and overhaul.

THE metal rims of the wheels or rims that carry the tires may rust because of water reaching them while being driven or washed, and this rust may cause the tire beads to adhere solidly to



Examples of Tire Areas Contacting with Road Surfaces: At Left, Partly Inflated; at Right, Fully Inflated.

the rim. This is known as "freezing" and the tire can only be started by applying pressure along the bead at the edge of the rim. Tools are made for removing tires that are "froze" to rims, these being of different types and sizes. Such a tool is very convenient to have in a garage, but it may not be needed in the tool kit. An acid or heat vulcanizing outfit is also desirable. With the small heat vulcanizer practically any small repair can be made. The acid outfits are extremely serviceable, but the secret of success is having all in readiness and applying the acid quickly, for the acid will harden the rubber almost instantly.

Removing and Putting on Tires.

Any man who understands tires can remove and put on tires with no other tools than a pair of short irons, and some will do the greater part of the work with their hands alone. If the tire is not frozen, after the wheel has been jacked and the shoe deflated, the end of a tire iron is placed under a bead some ways from the valve stem. If the outer end of the iron is braced against the shoulder and held by one hand, and the wheel turned with the other hand, the rim can be rolled over the flange of the rim without difficulty. There is a good deal in knowing how to hold the iron and brace it, for the tool is pushed along the rim as the wheel is turned. Care should be taken in placing the iron under the bead not to "pinch" the tube, for this may be cut if considerable pressure is applied.

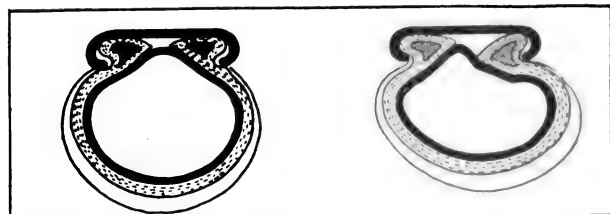
After one side of the tire is free the tube may be removed and the iron may be placed under the inner bead of the tire and this lifted over the rim. The experienced man will seldom need the second iron, but it will be found very useful for those who are not expert, and it can be utilized when a tire is stiff, which is usually when re-

moved for the first time. In handling the second iron it may be used to hold a shoe while the other iron is being placed under the rim. The bead may be worked over the rim without much labor until it is sufficiently clear to be manipulated with the hands.

Beads Should Not Be Broken.

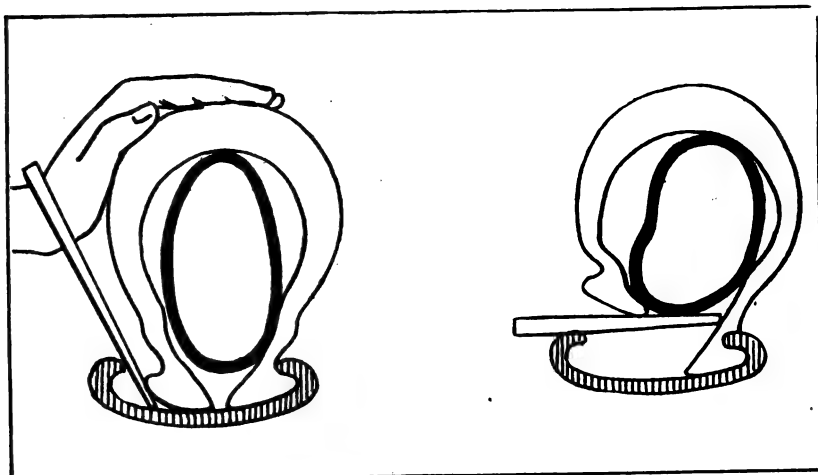
One should be careful and not exert too great pressure on the beads of the tires, for the harder material forming them may be broken. Once a bead is broken the tire is practically useless, for there is no strength to resist stresses, and a tire with a broken bead might be rolled from the wheel when turning a corner or by skidding. One is taking a risk if a tire with a broken bead is used.

Putting on a tire is almost a reversal of removing. The tire tube is inflated until it is round and is put into the case. The valve stem is placed downward in the hole of the rim. The inner bead is worked over the rim with the tire irons, beginning at one side of the valve stem half way between it and the point opposite on the inner tire circumference. When the inner bead is seated the tube should be pressed into the shoe and then the outer bead should be lifted over the outer rim, care being taken not to pinch the tube between the shoe and the rim. After the tire is on the rim, and before it is inflated, the shoe should be "rocked" from side to side the entire circumference of the rim so that the tube, if pinched, may be released. This is important, for a pinched tube will be quickly worn and a leak or a rupture will take place. The reader will understand that "rocking" or rolling the shoe on the rim will lift the inner edges of the beads, and when the tire is so manipulated the tube will, because it is partly inflated, draw from under them. After the tire has been seated it may be inflated.



Results from Tire Deflation: At Left, Beads Partly Out of Rim Flanges at Either Side; at Right, Bead Drawn Away from Rim by Rolling of the Tire Under the Wheel—Conditions That Cause Rim Cutting.

Because the tire tubes are soft and elastic and there is comparatively little resistance from them to tools, careless drivers sometimes will puncture



Removing the Tire from the Rim; the Tube Being Partly Deflated: At Left, the Casing Being Pushed Back with the Hand and the Iron Forced Between the Rim Flange and the Tire Bead; at Right, the Iron Carried Across Under the Tube and the Bead Raised Above the Flange.

them with tire irons, for seemingly light pressure on an iron against a tube will cause a cut. A tube can be repaired readily, but this is no reason for careless use of the tire irons. A driver cannot well sense the location of a tube and for that reason considerable care is necessary in the use of tire tools, either for removing or replacing a shoe.

Preventing Rusting of the Rims.

A suggestion that is well worth following and is intensely practical with reference to the care of tires is to prevent the rim rusting and the tires "freezing." When a tire has been removed from a rim the channel should be cleaned bright with a scraper, file and emery paper, so that the metal is practically free from rust. The channel should then be given a coat of shellac into which some powdered graphite has been stirred. The shellac will endure for a long time and the tire will be free whenever there is need of handling it. The graphite will give a smooth finish to the shellac, which is the main reason for using it.

The shellac will harden and it will endure a long time, but work on the rim with tire tools may chip it off in places, and for that reason an additional coat from time to time will be an insurance against rust. Note should be made that when water works under the tire the shoe is probably not fully inflated, and when the fabric of a tire becomes wet it will dry very slowly. Frequent wetting will result in the fabric deteriorating more or less rapidly and the period of usefulness of the tire is materially shortened.

When a tire is not inflated to standard pressure the beads are not closely seated against

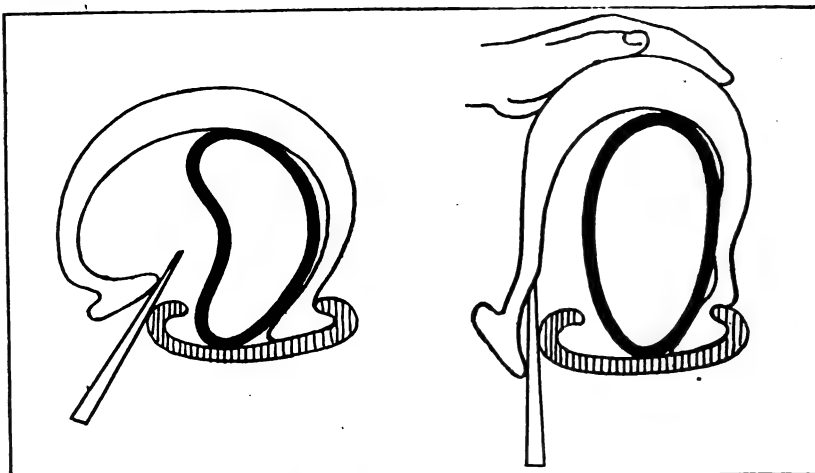
the rim, and should the machine be driven through water or in mud, or even washed in a garage, there is probability of more or less water finding its way into the shoe. This cannot escape and a shoe may contain more or less water for a long time. A shoe that has been filled with water will evidence it by the swollen appearance of the fabric, which will be enlarged and roughened, for saturation will considerably increase friction between the casing and tube.

There will be more or less movement of the tube within the casing because of the flexing of

the tire under pressure, and to minimize friction and the consequent wear and weakening of the tube, powdered talc or soapstone is liberally sprinkled in a tire casing when first installed, and when any change of tube is made there should be a plentiful sprinkling of powder placed in it. Saturation of this powder will largely destroy its purpose. While comparatively little water may find its way into a tire casing, the revolutions of the wheel, especially if rapid, will cause wetting of the entire inner surface. When the tire is partly deflated the varying pressures result in what may be regarded as a pumping effect, so that water may be drawn into and forced from the casing. One will understand that there is every reason to protect the rim against rusting and to prevent the interiors of the tires from water.

Danger from Oil and Grease.

Pure gum rubber is not as susceptible to influence of solvents and light as are rubber compounds. One of greatest causes for destruction of rubber tires is light, and spare casings and tubes



Clearing the Outer Side of the Shoe: At Left, Forcing the Bead Off the Flange by Carrying the End of the Iron Downward; at Right, the Iron at the Extreme Low Point and the Bead Cleared of the Flange, with the Tube Undamaged.

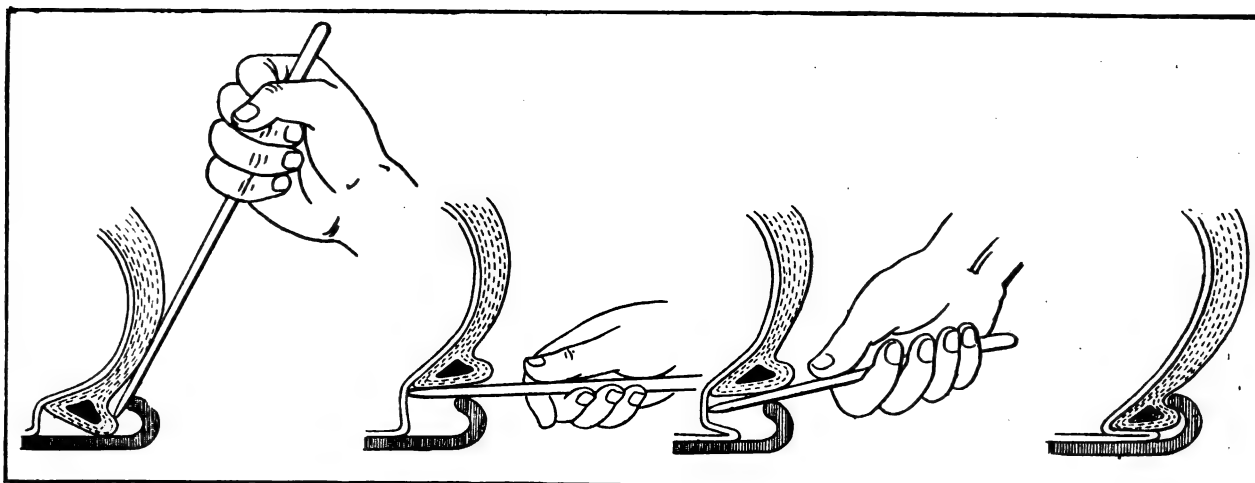
should be protected from light, especially exposure to the sun so far as this can be done. Tires can be enclosed in covers that are made for this purpose and the saving will be well worth the comparatively slight cost of equipment. Oil, grease and gasoline are destructive of rubber and tires should be kept free from those. This means that a garage floor ought to be clean of oil or grease and in the event of a lubricant being spilled or leaking from the car, it should be absorbed with sand and removed. If the floor is concrete, or even wood, an occasional cleaning with washing soda is a wise precaution.

Should the tires be moved where there is oil or grease, they ought to be wiped clean immediately. When the car is washed the tires should be cleaned as carefully as the body. This cleaning will expose any conditions that may not have been visible previously. When repairs are made to tires they should be as clean as possible.

The tires that are not needed for immediate use on a car should be protected with heavy paper wrapping and placed where the temper-

tain more gum rubber than are the shoes and they are usually with walls about $\frac{1}{8}$ inch thickness with reinforcing patches about the valve stems. These reinforcing patches are generally strengthened by fabric. Tire tubes should be thoroughly deflated and rolled flat and wrapped in paper so as to protect them against chafing and contact with oil or grease, and when placed in the car in readiness for use should be carefully packed. The tubes should be held by the stems and with the bodies flat may be folded or rolled, there being sufficient length of the ends with the stems left to fold them with the stems between the folds of the tubes. As the tubes might chafe along the edges of the folds they should be well wrapped and tied securely.

The owner should have what is known as a "blow-out patch" and a "sleeve" or "boot" or "gaiter" with which to make temporary restoration on the road in the event of a bad cut or rupture of the tire casing. The length of the blow-out patches vary, but the longer are better than the short because they will serve for practically



How the Tubes May Be Preserved or Damaged by Handling: At Left Are Illustrations of Careful Work with the Tire Irons to Keep the Tube Clear; at Right Are Examples of Careless Manipulation and the Probable Pinching Under the Tool or the Bead—Partial Inflation of the Tube Is Good Insurance.

ature is reasonably even and dry. If kept in a darkened room or closet the condition will be more favorable. Tires should not be exposed to extremes of temperature when stored. The influence of moisture or dampness upon the exposed fabric may not be serious, but good judgment dictates that the shoes be kept dry. Light causes the rubber to harden and if sufficiently exposed the surface may become porous, apparently from action on the sulphur that is a part of the compound. No chemical explanation for this action of light on rubber is made by manufacturers of tires, and as the original elements of rubber compounds are unknown to others, no precise reasons for this deterioration are stated. There can be no doubt, however, that light will more or less shorten the life of rubber as it enters into automobile tire construction.

Care of the Tire Tubes.

The tubes are made of compounds that con-

tain more gum rubber than are the shoes and they are usually with walls about $\frac{1}{8}$ inch thickness with reinforcing patches about the valve stems. These reinforcing patches are generally strengthened by fabric. Tire tubes should be thoroughly deflated and rolled flat and wrapped in paper so as to protect them against chafing and contact with oil or grease, and when placed in the car in readiness for use should be carefully packed. The tubes should be held by the stems and with the bodies flat may be folded or rolled, there being sufficient length of the ends with the stems left to fold them with the stems between the folds of the tubes. As the tubes might chafe along the edges of the folds they should be well wrapped and tied securely.

These are placed in the tire casings so that they are between the tubes and the damaged sections. The sleeve may be either of fabric, constructed much as is the tire, with a series of eyelets along either side for lacing, or with several straps and buckles. After the casing has been installed on the rim and before inflation the sleeve is put on and laced or strapped tightly, generally being secured to or around a spoke so that it cannot creep. A change of a tire is better than using a sleeve, but with this equipment a shoe that is unserviceable may be driven several hundred miles, or may be saved so that it can be well enough repaired to be used as a spare.

Care of the Valves.

One should be careful to replace the dust caps of the tire valves after they have been removed. A very small particle of sand under a valve will prevent it seating and give a great deal of trouble. The valves are small metal frames that carry plungers with rubber washers that seat against the valve ports or opening. The plungers are fitted with small springs that keep them seated and which are easily actuated under pressure. Sometimes, after continued use, the rubber washers will harden or will become so worn that they will not fully seat and the valve may leak. The only practical restoration is renewal of the valve. The valves cost but a few cents each and several of them can be carried in the tire repair kit in readiness for use when needed. The valves screw into the stems and are adjusted by turning with the upper end or top of the valve caps, which are slotted to fit the heads of the valve frames.

The tire repair kit that is necessary will include a series of patches of different sizes, several pieces of sandpaper, and one or more tubes of rubber cement. These are intended for use of tubes only. The patch should be large enough to extend an inch or more on all sides of a puncture or a cut. The surface of the tube should be cleaned and roughened by rubbing with sandpaper. On this should be spread a coating of rubber cement, which should be allowed to become dry. The patch should be similarly roughened and coated with cement. A second coating of cement should then be applied and dried. The third coating of rubber cement should be dried until it becomes "tackey," when the patch should be placed on the tube and the surfaces thoroughly contacted by pressure with the fingers. If possible the patch and the tube should be subjected to considerable pressure for from 15 to 30 minutes.

A very satisfactory press can be extemporized for use on the road with a block of wood and a jack, the jack being placed on the ground under a running board, the patched part of the tube being placed between the running board and the block, and the jack head being centred on the block. Whatever pressure is desired may be obtained with the jack handle. In the garage a vise and a couple of blocks of wood to press the tube, or a wooden clamp, may be used, or the jack may be found convenient. In the event the jack has been used for lifting the car to take off the shoe blocking of any kind may be placed under the axle, or the car may be lowered and blocking placed under the wheel rim, the car being again raised to install the shoe. No damage will be done if the wheel rim rests on the ground while the jack is being used for pressing the tire tube.

In the event that a tire tube has been punctured and one has no spare with which to replace it the shoe can be removed and, if the distance is not too great one can drive to a garage or home

on the bare rim. This will probably so damage the rim that it need be replaced, but if the tire is not badly cut and can be repaired one had better save the shoe at the cost of a new rim. Should one find driving the car on the wheel rim necessary, wrapping the rim with bagging may be sufficient protection to prevent damage. Rolls of bagging wired or tied to the rim, or a length of rope wound in the rim channel or similar expedients are practical if the tire is to be saved and the car is to be driven.

(To Be Continued.)

SPEED DRIVERS WILL BUILD CARS.

The opening of the 1917 speedway racing season will witness the entry of many new distinct types of racing cars. De Palma, Rickenbacher and Chevrolet will be in the field with new models of their own design.

Louis Chevrolet, who won the Universal Film Trophy race at Uniontown, Penn., speedway in a Frontenac, one of the three cars built by himself and Joseph Royer, Jr., will spend much of his time this winter tuning up these machines. Rickenbacher is planning a team of racing cars to be built at Detroit, which will be owned by William Weightman, 3d., of West Virginia, the sportsman racing driver, who made a good showing in the California road events. It is thought that Rickenbacher will drive one of these machines during the 1917 campaign.

Ralph De Palma, who recently organized the De Palma Manufacturing Company, will build racing machines which will be offered for sale to racing drivers and others who want high powered high speed cars.

MOTO-METER CO. GETS INJUNCTION.

The Moto-Meter Company of Long Island City, N. Y., has been granted an injunction, restraining the sale and use of the article known as the "Heat-Ometer" and the use of that name. The Moto-Meter company, which manufactures the Moto-Meter, first brought action against the Heat-Ometer Company, but before the papers could be drawn the latter concern, it is stated, removed from the jurisdiction of the court and the suit was brought against the New York City Distributing Company to enjoin it from selling the article known as "Heat-Ometer" and use of that name, claiming that it was an infringement on the "Moto-Meter" trade mark.

A stock Scripps-Booth four-cylinder model, driven by Wm. R. M. Very of the Isotta Fraschini Motor Company of New York City, attained a speed of 63 miles an hour in a spin around the Sheepshead Bay Speedway on Long Island. No changes were made in the car except that it was partially stripped and 30x3½ tires were used.

General Motors Earns \$2,250,000.

Annual Report Shows Cash and Drafts On Hand Amounting to Approximately \$22,946,000.

At the annual meeting of the stockholders of the General Motors Company, held in Jersey City, Nov. 22, President W. C. Durant announced that the company's earnings were running at the rate of \$2,250,000 a month. It was also announced that the company is doing 17 per cent. of the entire export business from this country in pleasure cars.

The financial statement as of Nov. 15 showed that the cash and drafts on hand totaled \$22,946,000, as against \$11,311,000 on the same day in 1915.

"To take advantage of low priced contracts and to provide for increased output, all of our companies have acquired large stocks of materials," said Mr. Durant in the course of his remarks. "Our inventory is now about \$30,000,000, 25 per cent. greater than would be required in normal times. The output in 1917 will be 20 per cent. ahead of that for 1916.

"The business of the company is in splendid condition. There are no mysteries or is there anything mystifying about the motor car business. It means capital, good management and organization and good product. Our product is uniformly good and our cash position excellent. We have a splendid position in the trade with an excellent equipment and organization."

During the three months following July 31, when the annual report was made, the General Motors Company sold 37,884 cars, as compared with 30,272 in the same period in 1915.

W. C. Durant was re-elected president and Pierre S. Du Pont was elected chairman of the board of directors. The other officers elected were as follows: A. A. Bishop and C. S. Mott vice presidents; H. H. Rice, treasurer; T. S. Merrill, secretary; M. L. Prensky, controller; Standish Backus, general counsel; L. G. Kaufman, Charles H. Sabin and J. J. Raskob, general financial committee. W. C. Durant, C. S. Mott, W. E. Chrysler of the Buick Company, W. L. Leland, vice president of the Cadillac Company; S. W. Warner of the Oakland, W. L. Day of the General Motors Truck Company and R. H. Collins, also of the General Motors Truck Company, were appointed members of the finance committee.

BOSCH COMPANY MAKES FOURTEEN CONTRACTS.

The Bosch Magneto Company has signed contracts with 14 large concerns engaged in the automobile and commercial vehicle industry providing for the use by these companies of Bosch magnetos for the coming season.

The concerns are as follows:

Thomas Evarts Adams, Inc., New York, N. Y.

Independent Auto Truck Company, Davenport, Ia.

Ben Hur Motor Company, Willoughby, O.

Luverne Automobile Company, Luverne, Minn.

Chandler Motor Car Company, Cleveland, O.

Drexel Motor Car Corporation, Chicago, Ill.

Lewis-Hall Iron Works, Detroit, Mich.

Hahn Motor Truck and Wagon Company, Hamburg, Penn.

Available Truck Company, Chicago, Ill.

G. A. Schacht Motor Truck Company, Cincinnati, O.

Wichita Falls Motor Company, Wichita Falls, Tex.

McFarlan Motor Company, Connersville, Ind.

Durable Dayton Truck Company, Dayton, O.

Twin City Four Wheel Drive Company, St. Paul, Minn.

Fisher Body To Defend Trade.

President Fisher Makes Statement About Infringement Suit Instituted Recently.

President F. J. Fisher of the Fisher Body Corporation states that his company will contest the claims of the Springfield Metal Body Company, in connection with alleged patent infringements.

Mr. Fisher says: "We have been advised by the best patent counsel we can get, and they confirmed our absolute belief that there is no infringement whatsoever. Had we ever thought we were infringing, we certainly would have abandoned that line of business, as it does not constitute over two per cent. of our entire business. We, however, prefer to stand on our rights."

NEW PRICES ON THE KISSELKAR MODELS.

The new prices on the KisselKar Hundred Point Six models, which become effective Dec. 1, show an advance of from \$100 to \$115 as compared with the prices prevailing prior to that date.

The new prices are as follows:

Five-passenger touring (not built for all-year top), \$1195.

Three-passenger roadster (not built for all-year top), \$1195.

Five-passenger Gibraltar touring (specially built for all-year top), \$1285.

Four-passenger Gibraltar touring (specially built for all-year top), \$1285.

Five-passenger Victoria (with detachable town car top), \$1950.

Five-passenger all-year sedan (including summer top), \$1635.

Four-passenger all-year coupe (including summer top), \$1635.

Any of these models equipped with five wire wheels, \$100 additional.

Parts Makers Merge Interests.

Standard Welding and Perfection Spring Companies Are Merged Into Standard Parts Company.

The merger of the Standard Welding and the Perfection Spring companies of Cleveland, O., into the Standard Parts Company, a newly organized \$35,000,000 corporation, also of that city, is one of the largest financial deals announced in the parts industry for some time.

The Perfection Spring Company has the reputation of making more automobile springs than any other concern in the world and the Standard Welding Company is one of the biggest producers of automobile rims and facings for solid tires, bicycle and motorcycle formed parts and light gauge steel tubing.

The Standard Parts Company's capital of \$35,000,000 consists of \$10,000,000 in seven per cent. cumulative preferred stock and \$25,000,000 common stock. Half of the preferred has been issued and \$8,000,000 of the common. A syndicate has underwritten the common stock that is to be issued and it will not be offered to the public; but \$4,000,000 preferred is offered for subscription at par.

The exchange of shares will be made on a basis of share for share figuring Perfection Spring preferred at \$110 and the preferred stock of Standard Parts at \$100, which would entitle the holder of the former securities to either \$110 in cash for each share of stock or a share of the preferred plus \$10.

Two shares of Standard Parts common are offered for each share of Perfection Spring common. The holders of Standard Welding stock have been offered either \$250 in cash for each share of their holdings and the privilege of participating in the underwriting of Standard Parts common to the extent of one-half the number of shares they hold.

The board of directors of the Standard Parts Company is comprised of J. H. P. McIntosh, Sr., F. F. Prentiss, H. P. McIntosh, Jr., T. E. Borton, Christian Girl, E. W. Farr and A. H. Goss.

OLYMPIAN MOTORS WILL INCREASE PRODUCTION.

The Olympian Motors Company, Pontiac, Mich., which had originally planned on a schedule of 3000 machines for the 1917 season, is anticipating a much larger production owing to the big demand that so quickly sprung up for the car. It is stated by one of the company's representatives that a production of nearly 9000 cars might become necessary.

The company is manufacturing in the plant formerly operated by the Flanders Manufacturing Company in Pontiac, and it is understood that it is sufficiently large and properly equipped for the enlarged production should it be decided upon by the company's officials.

Goodyear Earns \$7,000,000 Net.

Gross Business for Fiscal Year Was 80 Per Cent. Greater Than During Last Year.

The financial report made at the annual meeting of the Goodyear Tire and Rubber Company, Akron, O., showed that the past fiscal year was the most prosperous in the history of the concern.

There was an increase in the gross business from \$36,000,000 to \$63,000,000, at the rate of 80 per cent., and the net earnings jumped from \$5,000,000 to \$7,000,000.

All of the directors were re-elected, as follows: F. A. Seiberling, C. W. Seiberling, G. M. Stadelman, F. H. Adams, F. W. Litchfield, H. B. Manton and J. P. Loomis. The old board of officers was also re-elected, as follows: F. A. Seiberling, president; C. W. Seiberling, vice president; G. M. Stadelman, vice president and sales manager; P. W. Litchfield, vice president and factory manager; A. F. Osterloh, secretary; F. H. Adams, treasurer; W. E. Palmer, assistant secretary and assistant treasurer; H. J. Blackburn, second assistant treasurer.

PAIGE-DETROIT PAYS 170 PER CENT. IN 1916.

The stockholders of the Paige-Detroit Motor Company have received 170 per cent. dividends on their shares during the present year. The net earnings of the company for the current period will run between \$1,300,000 and \$1,400,000 on a capitalization of \$1,500,000, or at the rate of 90 per cent. The total cash dividends will amount to 60 per cent. for the year and two stock dividends of 80 per cent. and 30 per cent. respectively have been declared, making the total 170 per cent. The current assets aggregate \$2,000,000, including \$1,057,000 in cash and \$47,000 in Detroit city bonds. The liabilities are approximately \$270,000.

At a special meeting of the stockholders of the company held on Nov. 21, it was voted to increase the authorized capital stock from \$2,000,000 to \$3,500,000 by the addition of \$1,500,000 cumulative preferred stock.

PRECISION DIE CASTING COMPANY ORGANIZED.

The Van Wagner Die Casting Corporation, which was formerly the E. B. Van Wagner Manufacturing Company and the Precision Die Casting Company, are to be merged into the Precision Die Casting Company, Inc., a new corporation formed for the purpose in Syracuse, N. Y. The entire business of the two companies has been purchased from Charles Van Wagner.

The new company will be managed by men already well known in the manu-

facturing world. Alterations and extensions which will make for improved quality and service in die casting have already been undertaken and ample capital provided to take care of a largely increased business.

The officers of the Precision Die Casting Company are T. G. Meachem, vice president and general manager of the New Process Gear Corporation, president; J. W. Knapp, treasurer Van Wagner Die Casting Corporation, vice president; H. S. Tenney, secretary of Syracuse Trust Company, treasurer; E. J. Quintal, secretary. These officers and the following constitute the directorate: A. P. Bellinger of the Solvay Process Company, G. W. Bowen of the G. W. Bowen Manufacturing Company, Auburn, N. Y.; W. A. Ball of the Semet Solvay Company.

Velie Companies In New Hands.

\$2,000,000 Corporation, Under Name of Velie Motors Corporation, Has Been Formed.

The Velie Motor Vehicle Company and the Velie Engineering Company, both of Moline, Ill., have been merged into the Velie Motors Corporation, which has a capital of \$2,000,000. This action does not affect the status of the Velie Carriage Company, which will continue operations as an individual concern. There was no change made in the personal of the directorate that will conduct the business of the allied concerns, the directors being W. L. Velie, S. H. Velie, F. R. Todd, C. B. Rose, F. E. Bradfield, O. E. Mansur and L. E. Nutt.

CHANDLER MOTOR CAR EXTRA DIVIDENDS.

The regular quarterly dividend of \$2 and an extra dividend of \$1 a share has been declared by the Chandler Motor Car Company, payable Jan. 2 to shareholders of record Dec. 18.

At the conclusion of the last directors meeting, F. C. Chandler, president of the company, stated that the earnings for the current calendar year, with those for December, as estimated, would be approximately \$1,715,000, or the equivalent of \$24.50 per share on the \$7,000,000 capital stock outstanding. These earnings would allow a surplus of over \$1,000,000 after the payment of 10 per cent. dividends which have been declared since the first of the year.

DISCO STARTER WILL ESTABLISH BRANCHES.

A chain of branches will be established in the larger cities by the Disco Starter Company of Detroit to furnish owners of cars using that equipment with better service. Branches will be first located in New York City and Chicago and later in other large cities throughout the country.

Reo Has Assets Of \$7,000,000.

Combined Car and Truck Companies Report Earnings of More Than \$4,000,000 Net.

The Reo Motor Car Company and the Reo Motor Truck Company report net earnings of \$4,031,070.26 for the year ending Aug. 31, 1916.

The annual financial statement, under which the operations of both companies are consolidated, shows current assets of \$7,610,501.11, including a surplus of \$3,849,828.20. On the corresponding date in 1915 the company's assets were \$4,833,655.75.

The Reo Motor Car Company through purchase of all of the stock of the Reo Motor Truck Company is now the sole operating company and the following balance sheet is a consolidation of the returns of both companies:

Assets.	
Current	\$7,610,501.11
Capital assets	4,277,674.06
Deferred charges	16,345.31
Interest in other corporations	73,787.50
Liabilities.	
Current	\$1,191,229.78
Stock outstanding	6,937,250.00
Surplus	3,849,828.20

E. C. MORSE GENERAL MANAGER OF CHALMERS.

E. C. Morse, who became identified with the Chalmers Motor Company two months ago as vice president in charge of the selling division, has been appointed general manager and will continue in charge of the sales, service and advertising departments.

W. P. Kiser, formerly treasurer of the Chalmers company, has been appointed secretary and assistant general manager. D. P. Turnbull succeeds Mr. Kiser as treasurer.

PREST-O-LITE COMPANY AWARDED DAMAGES.

The United States District Court for the District of New Jersey has awarded the Prest-O-Lite Company \$3541.45 damages in that company's suit against Camille Bournonville and Ida Bournonville of Newark, N. J. This judgment is the largest so far won by the Prest-O-Lite Company in the litigation against refillers and dealers.

CLAIM FORD ASSETS ARE \$400,000,000.

In their final arguments in the suit brought by Dodge Brothers against Henry Ford, the former's lawyers claimed that the Ford Motor Company's capitalization is much greater than the maximum allowed by Michigan laws.

The company's articles of incorporation show a capitalization of \$2,000,000, but it was argued that the assets of the concern are now worth \$400,000,000.

**UNIQUE COOLING DEVICE.**

(Figure 271.)

An owner of a four-cylinder car was troubled by overheating of the third and fourth cylinders and found the plan illustrated in our sketch to be practical. He recalled the ventilator used on steamships and contrived a device somewhat similar, using sheet brass, which he rolled into shape, riveted and fitted to the hood between the third and fourth cylinders. The lower part of the ventilator was provided with a lip for attachment and through it was passed the machine screws and lock nuts used to hold it in place. In this way, the owner says, a considerable draught of air was deflected onto the engine block, although it was found in stormy weather that water and snow was carried into the power plant. He overcame this condition by fitting a lip to the top of the ventilator, as shown in sketch.

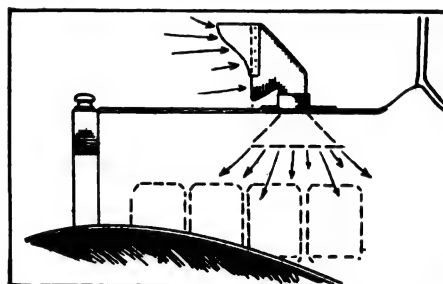


Fig. 271—Unique Cooling System.

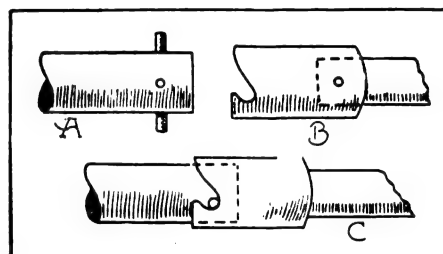


Fig. 272—Starting Crank Hint.

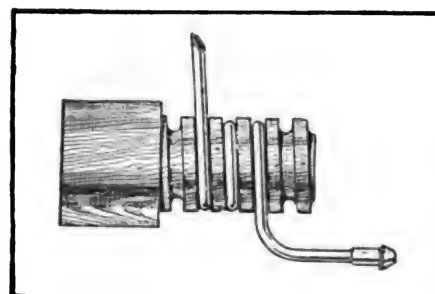


Fig. 273—Pipe Bending Jig.

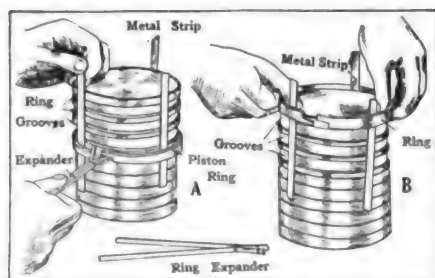


Fig. 274—Removing Piston Rings.

STARTING CRANK HINT.

(Figure 272.)

Owners of cars provided with manual starting cranks sometimes find that the bushing forming the bearing becomes worn, creating play that causes trouble if the design is of the jaw clutch type. In this design it is important that the clutch of the crankshaft and that on the starting handle are in alignment. When the bearing of the last named becomes badly worn the jaw members will slip, which will result in difficult starting. Our sketch illustrates a method of overcoming the trouble, which consists of displacing both jaw members and drilling and fitting a substantial pin to the extension of the crankshaft. A in the sketch shows the pin in place, and B the clutch member, which is made of steel and slotted, the two slots being diametrically opposite. The starting handle is fitted to the clutch and pinned, but in attaching it should be so fitted that the engine will be turned over past the ignition point before the handle attains a vertical position. This fact is important. The clutch in position on the crankshaft is shown at C. When the engine starts the clutch will be pushed out of engagement. The cost of the device is not excessive.

JIG FOR BENDING PIPE.

(Figure 273.)

If ever you need to bend a pipe, say the fuel tubing, and naturally wish to avoid kinking it, try the following method: Form a jig like that shown in our sketch, using a plug of hard wood about five inches thick and eight long. The jig is made by turning one end down to about $2\frac{1}{2}$ inches in diameter for about half the length of the plug and then cutting a thread about $5/16$ inch deep as shown, using a round nose tool of the same radius as the outside of the pipe. Placing the jig in a vise, the pipe is wound in the threads. If the pipe should be hard anneal it to draw its temper, and then fill the section to be coiled with melted resin. When the resin is hard wrap the pipe on the thread the necessary number of windings. The pipe is then unscrewed and the resin melted out.

BROKEN AXLE HOUSING.

(Figure 275.)

A car owner relates how he managed to get his car home after a rear axle housing became broken, traveling several

CARBURETOR ADJUSTMENTS.

A motorist who has had considerable experience in setting carburetors recommends adjusting them at night, when the color of the exhaust is noted more easily than at day time. This method is well known to carburetor experts, who advise an adjustment that will result in a purple flame. A yellow flame denotes too much air and a blue too much fuel. The work is done with the cutout open or with the exhaust manifold displaced.

REMOVING PISTON RINGS.

(Figure 274.)

When taking off piston rings the last one to be removed usually gives considerable bother. The work can be hastened and made easier if the suggestion illustrated in our sketch is heeded. Spread the rings slightly with whatever tool is handy for the purpose and then slip a thin strip of metal under the ring as shown in sketch and slide it around the piston to the side opposite the opening. Next insert another thin metal strip, and if necessary slip in a third piece, having them approximately in the positions shown in sketch. They then can be removed easily, as indicated at B, and without danger of distortion or cutting one's fingers. They can be replaced by the same method, in the reverse order, of course.

miles without further mishap, though naturally he had to be cautious while driving. He forced the parts tightly together and then placing four stout pieces of wood on the fracture, he bound them together with an equally stout rope, much in the manner adopted by physicians for holding broken bones in place. The ropes were tightened by using small strips of wood in tourniquet fashion and as illustrated in our sketch.

SECURING BUSHINGS.

(Figure 276.)

Even in the simple matter of securing bushings there is a right and a wrong way. For instance, if the method shown in the top view of our sketch is used, the cone-ended set screw may be screwed in so tightly as to cause the bushing to bulge slightly under the point and bind the shaft, especially if the wall of the bushing is light. Then again, if the set screw becomes loose, the bushing can move out of position, an undesirable feature if two holes are supposed to register. The proper way to secure a bushing is outlined in the lower view, in which it will be seen that the end of the screw is turned down to form a parallel side dowel that fits into a hole drilled clear through the wall of the bushing. This obviates bulging and holds the bushing in position at all times. A special drill and tap, which are shown in sketch, should be used. The drill is a two diameter tool, the small end being used to drill out the hole for the dowel pin, the larger lip being employed in drilling the hole that is tapped for the thread of the set screw.

LOST FILLER CAPS.

(Figure 278.)

If you should be so unfortunate as to lose the filler cap off your car you can meet the emergency by tying a piece of chamois over the opening, fastening it with cord or wire as housewives do some of their preserve jars. The cord or wire can be carried down to the headlight brackets on either side to give additional strength to the emergency repair.

EMERGENCY PIPE JOINT.

(Figure 277.)

It is not an infrequent happening that the water union between the cylinder and water pipe becomes broken through engine vibration or sudden and severe road shocks. If no tubing is at hand to make a replacement, a temporary repair can be made by utilizing a horn bulb, as shown in the sketch. Only the funnel shaped

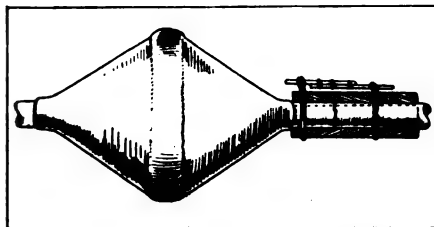


Fig. 275—Axle Housing Repair.

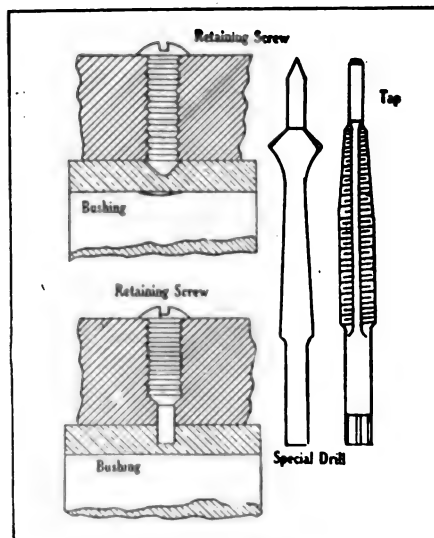


Fig. 276—Securing Bushings.

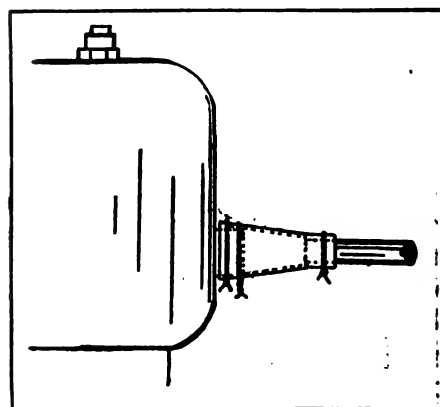


Fig. 277—Emergency Pipe Joint.

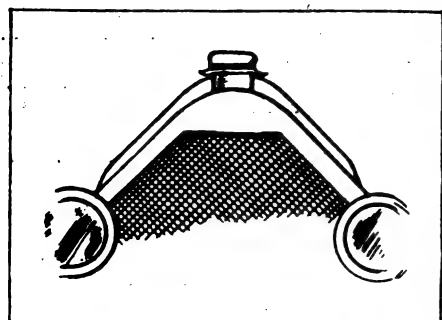


Fig. 278—Lost Filler Cap.

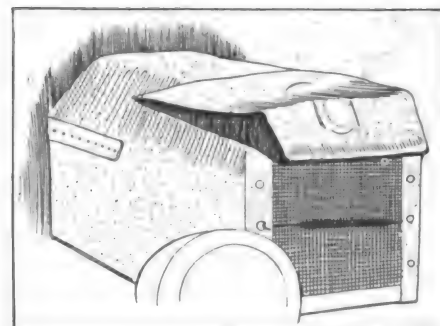


Fig. 279—Home Made Hood Cover.

part of the bulb is used, the smaller end being fitted securely to the water pipe and the larger end butted to the boss on the cylinder as shown. A water tight connection can be obtained by tightly binding both ends of the bulb in place with soft wire.

EASILY MADE HOOD COVER.

(Figure 279.)

In our sketch is shown a home-made hood cover for a Ford car that a car owner made for his machine and considers equal if not superior to the kind usually found on the market. One of the outstanding features of the contrivance is that the padding is made from an old bed comforter. The material utilized was a fairly heavy brown duck, and this was cut and sewn to conform to the shape of the hood, as shown in sketch. To retain the cover in place a coil spring was fitted, as shown. The flap lifts upward and when thrown back, as illustrated, remains in position without any fastening. This, the owner states, saves time when operating on days when the weather is too mild for running the car with the flap down, because the flap can be lowered instantly when the car is left standing for an appreciable period of time.

TESTING PARALLELISM.

(Figure 280.)

If one suspects that a wristpin is out of alignment a certain and simple way to test the parallelism is shown in our sketch. The connecting rod should be bolted to a mandrel the same size as the crank pin, as shown at P. The mandrel is rested in two V blocks, which in turn is placed on a level surface plate. While the distance from the surface plate to the top of the under side of the wrist pin, first on one side and then the other, can be measured with a foot rule, the most accurate method is to use a height gauge, as shown in sketch. The gauge can be made easily or purchased in most any supply store. This test may be made with the wrist pin alone, in case the piston has a domed top, or as indicated at Q, with the piston in place, if it is a flat top type that will permit of resting a spirit level or straight edge on it.

If your car should develop a burned-out connecting rod, it is better to take out the cylinder and damaged member and operate on the remaining cylinders than to risk incurring a large repair bill through running with a damaged rod. If the main bearing be burned out the car should be towed home.

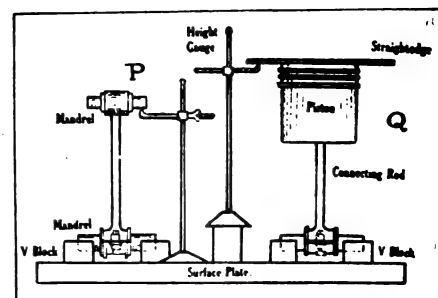


Fig. 280—Testing Parallelism.

MOTOR STARTING AND CAR LIGHTING.

Installation of an Ammeter in the Circuit-Connection of the Winding Terminals— Removing Generators and Motors for Making Repairs.

AMMETERS and voltmeters are really small motors and the only difference between them and the motors used for power is that the poles are permanent magnets and the armatures cannot rotate, but are turned against springs that resist the rotation. The construction of these instruments illustrates the practical application of the force developed by two magnetic fields, the circular field around the windings and the almost parallel magnetic fields of the magnets.

By this is meant that when a wire is placed across a magnetic field and a current is sent through it, the wire is forced the one way or another by the combined action of the two fields. The movement of the coil of the instrument against the pressure of the magnetic field causes the indication of the hand. The dial across which the hand moves is calibrated, and if it is graduated to amperes the instrument is an ammeter. As the current in any coil is proportional to the voltage across its terminals the number of coil turns must also be proportional to the voltage. The scale may be graduated to volts. The voltmeter has much greater resistance than the ammeter.

Expressed in another way, one may state that the ammeter does not appreciably resist the current, but the current is practically stopped in the voltmeter. The location of the ammeter in the car should be such that when connected it will measure all of the current generated that flows into the battery and all of the current sent out of the battery that is used for all purposes other than driving the starting motor.

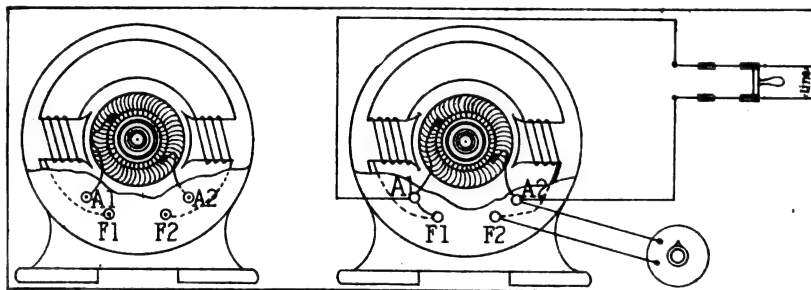
Connections for an Ammeter.

The connection is necessarily made with a wire that carries all of the charging current and all of the current used for the lamps and other accessories. Generally speaking the installation is made to a small branch from one of the two heavy battery cables and the indication will be the current value for charge and discharge. Should the charging and lighting circuits be connected at different points along the heavy battery cables, connection cannot be made that will show both charge and discharge. This condition obtains with many single unit systems that are so designed that there is no part carrying both charging and lighting currents that does not carry the starting current as well.

There are some systems so constructed that an ammeter can be located to show battery charging, but it will not indicate discharge from the battery. No real value can be attached to current generated unless it is sent into the battery, for then it may be drawn upon. An ammeter can be installed in a system as has been stated, but unless this can be done the wiring diagram or the system itself must be studied to find a part of the circuit from the battery supplying the lamps, etc., that does not carry a part of the starting current.

Construction of Armature Windings.

The current of all systems is originated primarily at the generator, and these machines may be either series, shunt compound wound. The reader has been informed that there are two windings for each pole of the compound wound generators, one for each pole of the series wound generators, and one for each pole of the shunt



The Connections of a Shunt Generator: At Left, the Connections of Windings to the Terminals; at Right, the Same Machine Connected for Practical Operation Through a Rheostat.

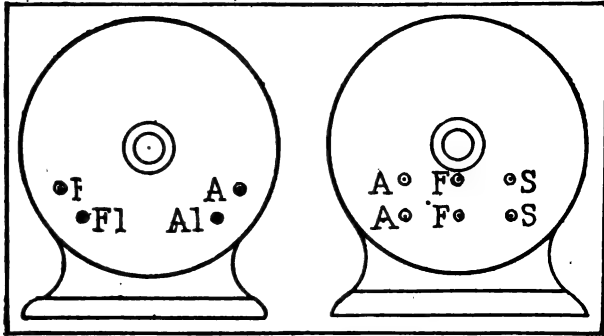
wound generators. All the current from the series wound generator armature goes through the field coils before passing out of the machine. But a small part of the current from the shunt wound generator armature passes through the field coils, the main current being shunted around the field. All the current from the compound wound armature passes through the field, but the main current goes through the series winding and the shunted current through the shunt winding.

The same general classification may be applied to motors. When the current that is sent into the machine goes through both the armature and field coils it is known as a series type; when the current is divided, part of it going through the armature and part through the field coils, it is a shunt type; when the full current goes through the armature and in two circuits through the field coils it is a compound type.

The Connection of the Terminals.

As the series wound generator is not used in starting and lighting systems, it need not be con-

sidered, but the shunt and the compound types are in common use and the electrician in examining them will find that there are from two to



The Difference in Generator Terminals: At Left, a Shunt Type; at Right, a Compound Type.

four terminals for connection of the wiring of the machine with the outside circuit. One will note in an accompanying illustration of a shunt generator that with this particular type there are four terminals, two for the field and two for the brushes. The field terminals are marked F1 and F2, and the brush or armature terminals are designated as A1 and A2. Since the current in the field must come from the brushes F1 and A1 and F2 and A2 are connected. The value of the current in the shunt coil is determined either by an automatically variable resistance, which is in effect a rheostat, or by manner of winding. The variable resistance control may be of electromagnets that increase the resistance of the shunt field circuit, or open the shunt field under certain conditions or vary the field circuits, or by governors that limit armature speed or vary the resistance in the field or charging circuit. The winding regulation may be either compound, reversed series or the "bucking coil," or the third brush. The characteristics of these have been previously considered and no special description of them is required. In the accompanying illustration or diagram of a shunt wound generator a rheostat is shown as the simplest presentation of the idea of control. A diagram is also presented that shows the terminals of a compound generator, A-A being connected with the armature through the brushes, F-F to the shunt field coil, and S-S to the series field coil.

One will find that tracing the coils from the terminals of the generators and the motors is comparatively easy, so that one may determine their condition. While there ought to be no special reason to expect failure of the machines, provided they are given reasonable attention, there are possibilities of different forms of defects developing.

Mountings of the Machines.

A very general practise is to mount the generators and motors on the crank case of the engine, although in some instances they are installed on the sub-frame of the car or on the transmission gearset case. The main purpose is

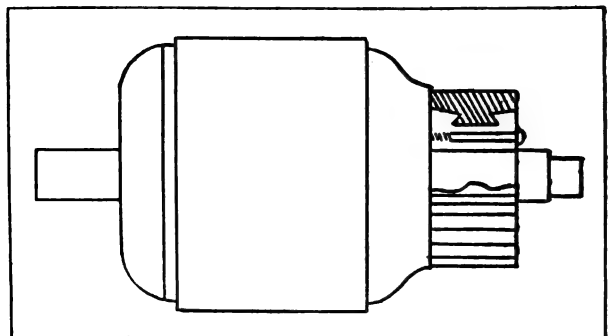
to have the machines so well seated that the shafts shall not be misaligned by the stresses of generating current or starting the engine. The bases of the machines are established with reference to the design, because if the magnets are so shaped that when installed a piece of iron or steel extends across the poles there may be deteriorating influence from the condition. A base of aluminum or brass would be a safer construction and would insure against any influence that would change the efficiency of the magnets. If the case is iron the machine may be mounted on an iron base.

A purpose with all manufacturers of generators and motors is to protect them from water and dust so far as possible, and the housings are expected to be tight, but this is no reason why the machines should not be given careful attention and kept clean. If oil, grease, water and dust are wiped from the casings at frequent intervals there should be very little probability of anything finding its way into them. Water might be the cause of a short circuit and an accumulation of dust might be a conductor of electric current in some conditions.

But One Rotating Part.

There is but one rotating part within the machine housing, this being the armature. The generators, because they are in constant operation, are usually fitted with annular ball bearings that may be packed with grease, and a thorough cleaning and lubrication of the bearings once in six months will be practically all the attention needed they will require, but some of the motors, which are used only for starting the engines, have plain bearings, and care is necessary to insure that these are adequately lubricated.

The interiors of the casings, however, ought to be cleaned by wiping with a cloth or a brush because there will be more or less dust formed by the wear of the brushes and commutators of the generators, and if this dust accumulates on the brush holders it may become a conductor, or it may work into the bearings and cause un-



Section Sketch of an Armature, Showing the Theory of Commutator Construction.

necessary wear. Cleanliness of the interiors of the machines is a safeguard that should never be neglected. If the dust is dry it may be blown

out with compressed air. Absence of dust is an insurance against one form of short circuit.

Making Ready for Disassembling.

Before a generator or motor is loosened and removed from its base and the driving connections are uncoupled, all the wiring ought to be disconnected and the machines made ready with much care. When the cover plates are taken off they should be drawn away from the machines in straight lines from the cases, the reason for this being that on these covers are sometimes mounted differing parts, brushes, springs, contacts, etc., that might be so damaged that adjustment might be difficult, if at all possible. Striking these parts or straining them might cause results that could be just as well avoided.

In the inspection or work these plates or covers must be taken off carefully, and next the pig tails must be taken from the terminals. The brush springs must either be removed or set at one side of the brushes so that they will not be broken or bent. When removing the brushes and the spring adjustments must be loosened, care should be taken to obtain the same adjustment when reassembling the brushes. This is extremely important, and here emphasis should be made of the necessity of marking every part so that it may be restored to the original position when reassembling. If the brushes are taken from the holders, or when the brushes and holders are taken out together, they should be marked so that each brush will be replaced in the holder from which it was taken, with the same side toward the front end of the machine. The reason for this is that each brush wears to a perfect fit of the commutator and if changed in any way will not fit, causing inefficient operation.

Brushes Must Be Correct Design.

The brushes are selected for the machine and the location, brush material, shape, size and pressure are all factors that have to do with current or power production. No brushes other than those furnished or recommended by the manufacture of the machine should be used unless in the event of extreme necessity. A brush not suited or fitted to the commutator will wear quickly and perhaps damage the commutator, will cause undue sparking, heating, will lower the production and discharge the battery.

The contact surfaces of the brushes are shaped to exactly fit the contour of the commutator and for the entire cross sections of the brushes and when but a part of the brushes seat sparking will be caused that will be more or less destructive of the commutator segments. The contacting surfaces of the copper brushes ought to be bright, smooth and clean, and those of the carbon brushes ought to be dark gray in color, clean, smooth and slightly polished. If these conditions do not exist the brushes require some attention.

Removal of one and possibly both of the main

bearings of the armature may be necessary to take out the armature after the brushes have been removed, and these are usually retained by small screws or bolts that are easily accessible if annular type and no specific directions are necessary in connection with the bearing mountings. If the bearings are plain, these are generally bronze bushings that may be slipped from the shaft in front, and then the armature may be withdrawn from the tunnel.

There may and probably will be no need of taking out the field poles and the windings unless there has been damage of a serious character. But in disassembling the ends of the field windings must be loosened carefully and drawn through holes through which they may pass, which will make possible examination of the wires from the ends to the field coils. The coils can remain on the pole pieces, which are screwed or bolted to the housing. But if there is necessity for removal they should be replaced in precisely the same positions, and they ought to be marked so that they will be correctly restored. The terminals of the wiring should also be identified so that they may be replaced as they were before. This identification is, as has been previously emphasized, extremely important.

No condition of the armature should be found unless from an accident that will bend or twist the shaft. If the shaft is not in alignment it may be so deformed that the core will touch the poles, in which case the shaft may be taken out. If the distortion is near the end it may be straightened cold, but if not the best restoration would be to send it to the manufacturer for the installation of a new shaft. A good deal of care is necessary in balancing an armature and unless the worker has had considerable electrical experience no work of this kind should be attempted.

There is more or less probability of defects being developed in the windings of the armature, which will be quite beyond the average owner or repairer to deal with. The condition of the armature can be determined, however, by several practical tests that can be undertaken, and the nature of the defect will be shown with one of the testers that has been described.

(To Be Continued.)

SPRINGFIELD SHOW SUCCESSFUL.

More than 100 cars were attractively displayed at the second annual automobile show held during the week of Dec. 4-9 in Springfield, Mass., in the auditorium, and it was conceded to be largest in point of attendance ever held there.

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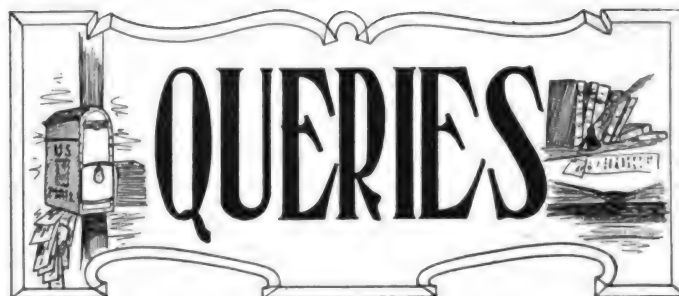
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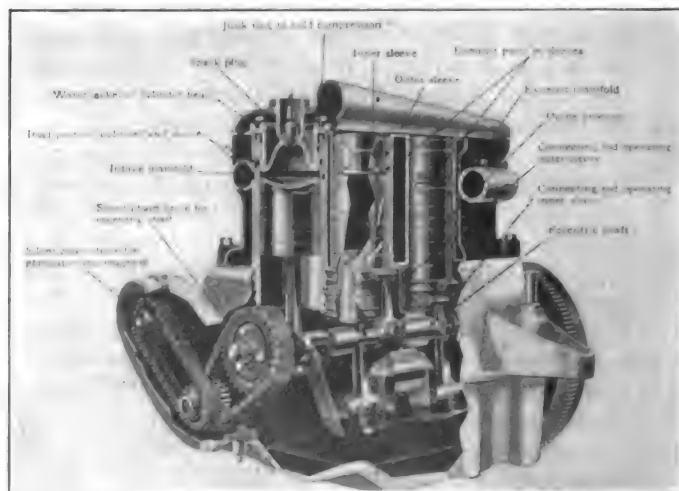
THIS department contains the Mechanical Editor's answers to readers' inquiries. It is open to every subscriber. If any part of your car is not operating satisfactorily, or if you desire information regarding operating, maintaining or repairing motor cars, do not hesitate to lay your troubles before him. He will answer promptly and fully, either by mail or in these columns, as you direct. This service is free to every subscriber, and is often the means of saving considerable money that otherwise would be spent with a garage man. Letters should always be signed with the writer's full name and address, and the car or part in question should be properly identified, by mentioning the maker's name, model, year of production or other distinguishing feature. Address all inquiries to the Mechanical Editor.

DIFFERENCES OF KNIGHT ENGINES.

(A. D. G., Lebanon Springs, N. Y.)

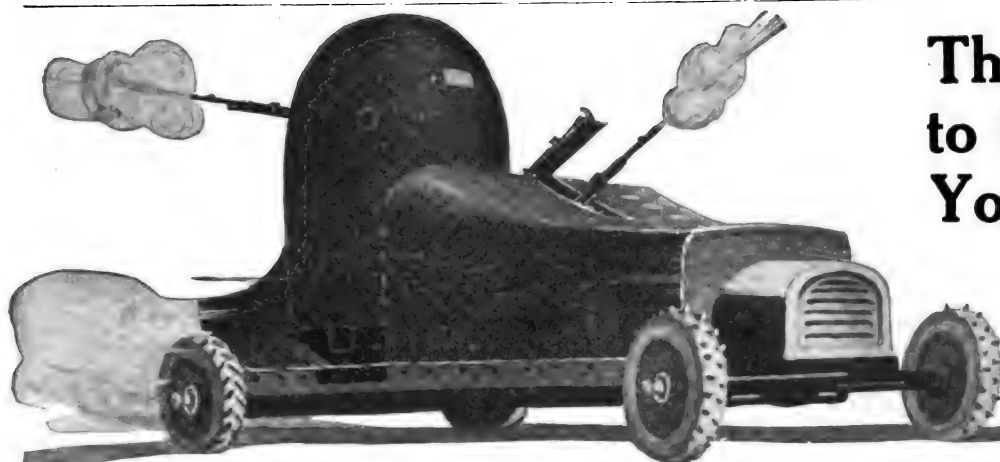
What are the differences between the power plants of Willys-Knight, Stearns-Knight and Moline-Knight four-cylinder cars? Are there other American cars with Knight engines?

In principles there are comparatively little differences, but there are differences in constructional detail in each engine. All three manufacturers cast the cylinders en bloc. The cylinder dimensions are: Stearns, bore $3\frac{1}{4}$ inches, stroke 5 $\frac{1}{2}$ inches; Willys, bore $4\frac{1}{8}$ inches, stroke $4\frac{1}{2}$ inches; Moline "50," bore four inches, stroke six inches; Moline "40," bore $3\frac{3}{4}$ inches, stroke six inches. The intake and exhaust manifolds of the Stearns are cast integral; the intake and exhaust manifolds of the Willys are cast separate; the intake of the Moline is cast integral and the exhaust separate. The pistons of the Stearns and Willys engines are cast iron; of the Moline, aluminum alloy. The connecting rods of the Stearns and Moline "50" are tubular; of the Willys and Moline "40" I section. The pistons of the Stearns and Willys engines have two rings and the Moline engines have three rings. The Stearns engine is cooled by water forced by a centrifugal pump; the Willys and Moline engines are cooled by thermosiphon circulations. All are lubricated by force feed systems, the crankshafts being drilled to lubricate the main bearings, and the oil thrown off by centrifugal force from the crankshaft lubricates the other moving parts. The crankshaft of



Cross Section View of a Willys-Knight Engine.

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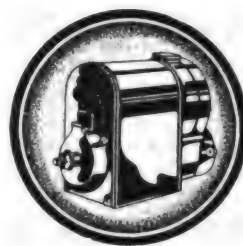
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the Stearns engine is built with counterweights to obtain balance. The carburetor of the Stearns engine is bolted directly to the cylinder block, those of the Moline engines are bolted to short "risers" that are practically elbows, that of the Willys engine to a long "riser" that extends over the top of the engine block.

These are the main differences between the three makes of engines. To describe each in detail is manifestly impossible. You can obtain more complete descriptions if you desire by writing the manufacturers.

MECHANICAL PREVENTION OF FREEZING.

(N. S., Jr., Chicago, Ill.)

Is there an invention or automobile accessory which, connected to the battery, will prevent the water in the radiator of the engine cooling system from freezing; if so, how much current is required to operate it?

So far as convenient records show, no such device is manufactured or sold commercially. Such an accessory may have been comprehended in a patent or an application for a patent.

As to the current required for maintaining the temperature of an engine cooling system above the freezing point, that would depend entirely upon the volume of water it contained and the temperature of the atmosphere, both of which might be extremely variable. Generally speaking, however, the demand would largely exceed the capacity of the conventional lighting or starting system battery.

There are devices sold that burn kerosene, that may be attached to radiators, which are designed to prevent freezing. These are not intended for use outside of the garage.

ELECTRICAL SYSTEM OF MOON 1913.

(C. A. Dendero, Abington, Mass.)

What starting and lighting system was installed in the 1913 Moon car? Is the car still manufactured, where is the factory and the nearest agency?

(When Writing to Advertisers, Please Mention The Automobile Journal.)

The Moon car is manufactured by the Moon Motor Car Company, St. Louis, Mo., and the company is active in the industry. We have no record of the equipment of the 1913 series of cars, but from 1914 the cars have been equipped with Delco systems. Communicate directly with the car manufacturer for the information you desire.

GEARSHIFT SLIPS INTO NEUTRAL.

(G. F. K., Waterbury, Conn.)

I am having considerable trouble with the gearshift of my car slipping from either second or high speed into neutral. This usually happens after the gas is reduced after pulling up a long hill, or going over a sudden bump. Car is a model 25 (1915) Maxwell. I have renewed the pins in the gearshift and also renewed the dogs. The gears are not worn, and the only suggestion I might advance is that the bronze bushing between the engine shaft and the transmission is a trifle loose. I don't think this has any connection with the trouble, but I would appreciate your advice in the matter.

There are three possible causes of the fault you describe. The one is the wearing of the bearings of the transmission shaft; the second is the faces of the gears worn tapering from meshing less than the full width; and the third is that the head is worn from the locking pin of the shifting-rod. Any one of these would prevent the gears fully meshing and they might gradually work clear of each other. Examination of the gearset case will probably show that one or more of the conditions stated exists.


CONSUMPTION OF GAS IN A SIX.

(W. H., Thornton, R. I.)

What is the actual consumption of gas (not gasoline) in a six-cylinder engine having a bore of 3 9/16 inches and a stroke of 5 1/8 inches, for one mile running on high gear only? The car is fitted with 34x4 tires on all wheels. The driving pinion bears a relationship to the large ring gear of four to one. By gas I mean cubic feet of explosive gas taken into

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the cylinders at atmospheric pressure.

The piston displacement of the engine having the dimensions you specify is 306.5098500 cubic inches. The wheels must turn 593 revolutions to the mile. The engine must make four revolutions, firing each cylinder twice, to each wheel revolution, or 2372 engine revolutions a mile. The gas drawn into the cylinders would be 363520.6821000 cubic inches, or, approximately 210.36 plus cubic feet. Theoretically this volume ought to be entirely consumed.

HOW TO MEASURE GEARS.

(E. B. H., Rochester, N. Y.)

You have helped me several times in the past by answering my questions and I would like to have you tell me how gears are measured to obtain distances, holes, pitch, etc. Can you make a diagram showing the methods?

In measuring gears, for example, those of the spur, involute type, the factors to be considered are: Pitch, pitch diameter, outside diameter, face, hub diameter (if hubs are used) and hole.

Diameter, when applied to gears, is always understood to mean the pitch diameter. Diametral pitch is the number of teeth to each inch of the pitch diameter. For example: If a gear has 40 teeth and the pitch diameter is four inches, there

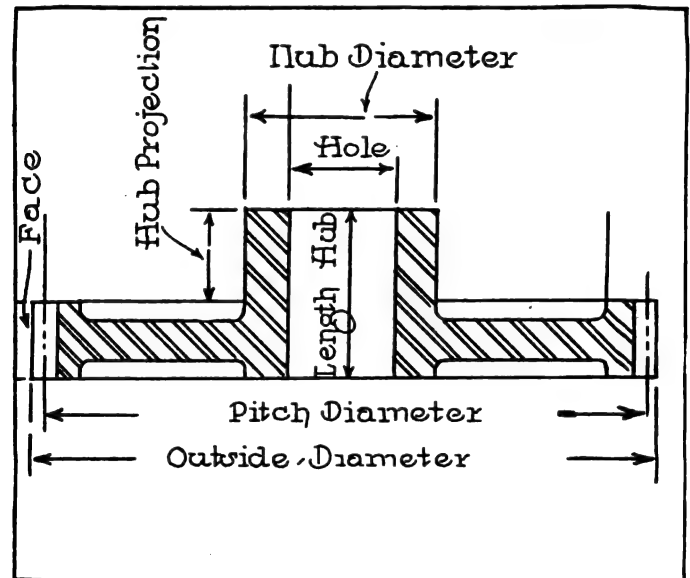


Diagram Illustrating How to Measure Gears.

are 10 teeth to each inch of the pitch diameter and the diametral pitch is 10, or in other words, the gear is 10 diametral pitch.

There is a difference between the pitch and outside diameter, as will be noted in our sketch, which shows the factors requiring consideration in determining measurements of gears. It will be seen that the pitch diameter is slightly less than the outside diameter and this should be borne in mind when figuring the distance between the driving and driven gear.

The distance between the centres of two gears may be obtained by the following method: Add the number of teeth together and divide the sum by one-half of the diametral pitch. Example: If two gears have 50 and 30 teeth respectively, and are five pitch, add 50 and 30, making 80, divide by two and then the quotient, 40, by the diametral pitch, five, and the result, eight inches, is the centre distance.

CHECKING VALVES AND TIMING.

(A. A., Syracuse, N. Y.)

What is the correct way to check the valves on a six-cylinder engine? In what position should the pistons be? Should they be checked in the order of firing, or, starting on the No. 1 cylinder go through the inlet valves and then come back on the exhaust side?

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You do not give essential information that will really determine the proposition. The make of engine and firing order are desirable, as well as the type. From the composition of your questions I assume that the engine is T head.

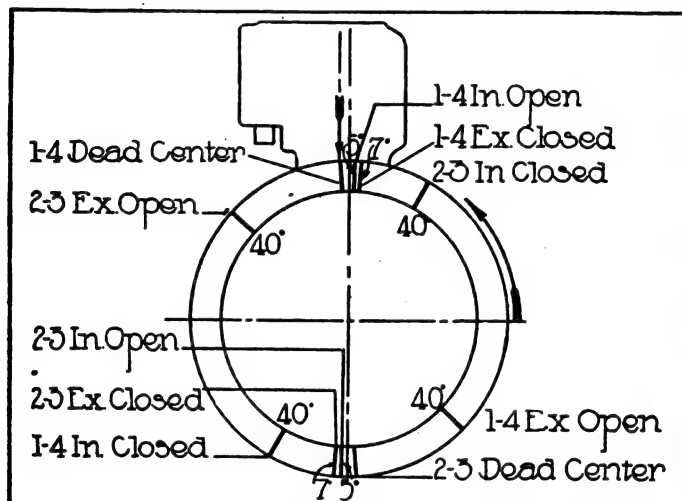
There is one very certain way of checking the valves and the timing. Taking the No. 1 cylinder as a basis the engine should be turned and the inlet valve observed. The valve will lift during the suction stroke, and after the valve has closed and the piston is at top centre the firing point has been reached. The spark should be set for this point. Then the timing gear can be advanced or retarded one tooth as may be necessary to obtain the desired power. If the exhaust valve is set to open at top centre there is no assurance that the timing will be correct. One will understand that with an L head engine the valve setting may be made from one valve of one cylinder. If the T head type engine, with two camshafts, the exhaust valve is set approximately at top centre, and it should close just as near to the opening of the inlet valve as it can be set.

TIMING OF REGAL T MOTOR.

(C. F. K., Yonkers, N. Y.)

I bought a second hand car recently. It is a Regal, model T, and I am puzzled by the marks on the flywheel. Do they relate to the timing of the motor? Can you print an illustration showing what the timing is?

The marks on the periphery of the flywheel indicate, as



Timing Diagram of a Regal Model T Motor.

you suspect, the valve timing of that particular make of engine. While at first glance they appear to be confusing to the uninitiated, they are easily understood if one takes into consideration the operation of a four-cycle engine; that is, the strokes and the number of revolutions of the flywheel.

The accompanying illustration shows the valve timing of the Regal engine you mention. Intake opens five degrees past centre and closes 40 degrees past centre; exhaust opens 40 degrees past centre and closes seven degrees past centre. In the sketch it will be noted that there are two lines diametrically opposite each other, the one at the top being 1-4 and at the bottom 2-3. These indicate the dead centre positions of the pistons of the first and fourth and second and third cylinders respectively. These marks are essential in valve and ignition timing.

There is an arrow on the cylinder, which is the indicator. When the 1-4 and the 2-3 marks register with this arrow the dead centres are obtained. The arrow is also employed to time the opening and closing points of the intake and exhaust valves.

HIGH AND LOW SPEED ENGINES.

(H. O. F., Lockport, N. Y.)

Will you give me the correct timing for a 1914 Harley-Davidson motorcycle? What is the difference between a high and a low speed motor?

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Series TR4—Four Passenger Roadster.
Series TC—850 lb. Delivery Wagon.

Inter-State Motor Co., Muncie, Ind.



Charles River,
Mass.

A Harley-Davidson motorcycle (twin-cylinder) is timed from the rear or No. 1 cylinder. In timing the engine the spark is advanced as far as possible. With this setting the piston in No. 1 cylinder is turned until it is at the top of the compression stroke. The position of the piston can be determined by a piece of wire placed in a spark plug hole. Mark the wire with a file when the piston is at top centre. Then back the engine until the piston is not less than $\frac{1}{4}$ inch and not more than $\frac{5}{16}$ inch below top centre. If the wire is marked for the second point it may be used as a gauge for timing the engine.

If you examine the cams in the circuit breaker box you will find them numbered 1 and 2. Set the cams so that with the spark as far advanced as possible No. 1 cam is just beginning to break. At this point mesh the timing gears and the engine will be correctly timed. This formula will apply to all stock machines.

A review of engine design, such as your question suggests, is not practical because of space limitations, but as compared with slow speed engines those built for high speed have lighter reciprocating parts, especially the pistons and connecting rods; the combustion chamber will be smaller, from 18 to 20 per cent. of the total volume; the valves are lighter and larger in area, and the location of them is important, and other factors are the valve timing, the form and size of the inlet manifold, the location of spark plugs, form of cams and method of lubrication. The materials must be higher grade and the work must be very close. Extremely high speed engines are designed for racing as a rule and they are decidedly expensive as compared with stock productions. There is, of course, extremely wide range from types that are practical and enduring and economical to those that are designed to develop very high power for comparatively brief periods, and which require a great deal of attention.

ENGINE KNOCKS AND LOSES POWER.

(R. D. G., Reading, Penn.)

I have a 1912 seven-passenger, four-cylinder Abbott touring car, Continental engine, that has been driven 10,000 miles. For the last few months I have noticed a knock in the engine and more or less loss of power. A garage man believed the cause to be a worn crankshaft bearing and cylinder carbonization. After the overhaul the knock was made as before, and after 100 miles there was a decrease of power to about the same condition as before the work was done. It is my opinion that the cylinders need reboring. If you are of the same opinion can you give me particulars as to what the cost of reboring would be approximately and whether I will need new pistons and rods? Any other information will be appreciated.

Evidently the repairer making the overhaul did not find the cause of the knock, and assuming that he examined the main and connecting rod bearings and made such adjustment as was necessary, and cleaned the cylinders and pistons of carbon, there are a number of conditions that might obtain that would cause a knock. The flywheel might be loose, a wristpin might be loose, one or more valve guides might be loose and badly worn, and a piston might slap in a cylinder. But in addition to the knock is the loss of power. You do not state whether the compression of the cylinders is now high, fair or low, and no condition is stated by which to judge with reference to reboring. If the compression is low there is reason to believe that new rings might increase the power, but reboring ought to restore the normal power if no other conditions exist. The worn guides would cause the valves to rock and not seat completely, which would undoubtedly mean leakage of gas, and there is possibility of a leaky inlet manifold, which would also result in dilution of the fuel. There might be leaky valves or leaky manifold or leaky valve guides in combination with any of the causes for the knock previously given. Only careful examination will determine the exact cause.

The cost of reboring cylinders and fitting new pistons and rings will vary with the dimensions of the pistons and cylinders, number of rings and the concern doing the work. There are specialists that undertake to rebore cylinders and fit new pistons and rings for approximately \$50 for a four-cylinder en-

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gine, which is a very reasonable price. If cylinders are re-bored new pistons are usually necessary, but there would appear to be no reason for using new rods.

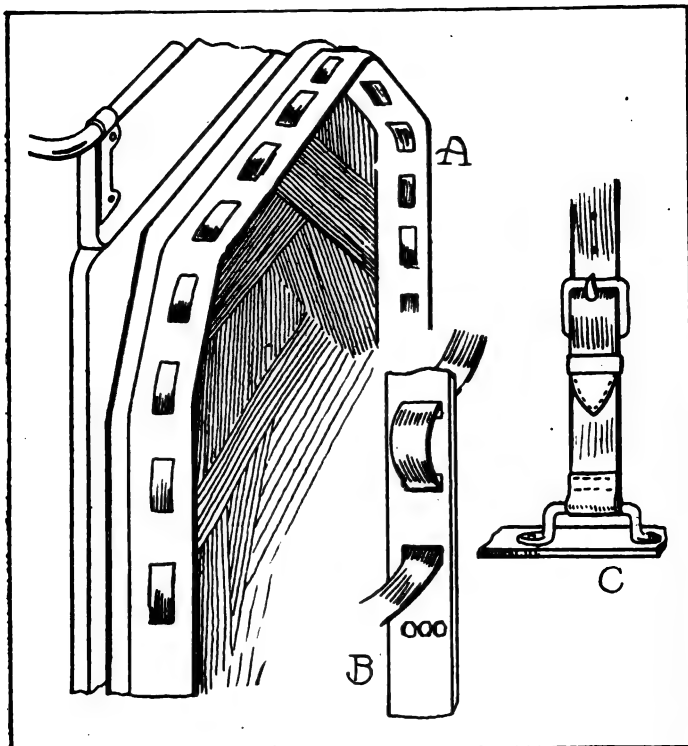
HOODS THAT RATTLE.

(A. E. S., Trenton, N. J.)

How can I stop the rattling of the hood on my automobile? The car is an old one and the hood is a long affair. The side clasps appear to be snug fit, but the hood rattles when I go over rough places. Would a bonnet strap stop the racket?

Though a hood strap, as suggested, should eliminate the rattle referred to, a better method would be to equip the dash and radiator supports of the hood with some anti-noise material, such as leather or raw hide. Possibly you might adapt the method some makers of the past utilized on their cars. They slotted the hood supports and wove in belt lacing, as shown at A in the sketch. At B is shown how the metal may be prepared for the leathers. Drill one or more holes then break out the edges with a small chisel, afterwards smoothing the rough places with a file. The lacing should be knotted at one end and inserted as illustrated.

A hood strap could be applied easily and would not be



Illustrating Method of Preventing Rattling of Hood.

very expensive. A handle, such as illustrated at C, which also shows the fitting of the strap, is attached to each board supporting the hood and to these is sewed the strap, which is made in two sections. One is equipped with a buckle and the other perforated.

REMAGNETIZING MAGNETO MAGNETS.

(H. A. C., Wethersfield, Conn.)

A year or more ago you published a drawing and a description of an apparatus for remagnetizing magneto magnets that an Englishman had made. Can you tell me how the machine was constructed and how it was operated? Probably you can print the illustration again. If so, I would be very appreciative.

The drawing and description you refer to originally appeared in *Commercial Motor*, a British publication, and the maker of the device was awarded a first prize in a contest held by that magazine company. The apparatus and wiring diagram are shown in our illustration.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

If You Have Engine Trouble, Read This

WHEN the ignition system of an engine depends upon a battery, the possibility of trouble is evident—so much else depends on that battery too.

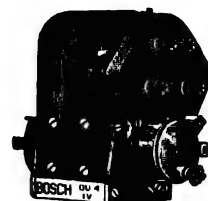
Ignition should be alone, independent of all other units; it should be produced by a good magneto which performs no other function than producing reliable and efficient ignition. When you have magneto ignition, then and only then can you be free of puzzling ignition worries and starting difficulties.

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To offset the high price of gasoline, the best engineering talent in the world has perfected light-weight steels and scientific body construction. Aluminum has been largely used despite its scarcity. In almost every part of the machine excess weight has been eliminated.

Strange to say, no one seems to have given much consideration to the weight of tops.

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It is guaranteed one year against leakage. No top has a finer appearance, and, although light in weight, it has all the strength required and is built to last as long as the car.



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Du Pont Fabrikoid Rayntite will duplicate the remarkable success of Du Pont Fabrikoid Motor Quality—the Standardized Automobile Upholstery—used on 80 per cent. of 1916's entire output.

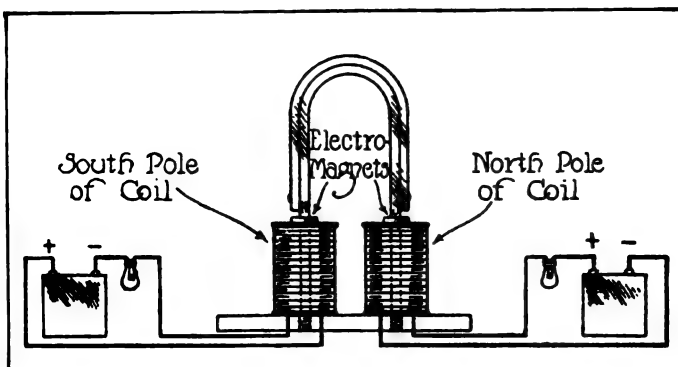
It will be noted that two storage batteries are utilized, also two light bulbs. To make the apparatus, two pieces of soft iron are employed, each about six inches long and about 1½ inches in diameter. The base is constructed of a piece of "mild" steel plate in which are tapped two ½ inch holes and these are threaded to take one end of the iron core.

Before screwing the core pieces in position they are wound with an equal number of turns of No. 22 gauge insulated copper wire, the ends being left free. Four terminals are attached to these. The wires are connected up to a pair of storage batteries, as shown, and the latter are so wired that the polarity of the soft iron cores, indicated by a compass needle, is north and south respectively.

The inventor of the apparatus stated at the time he was awarded the prize that should the coils show signs of overheating, one or more lamps should be placed in each circuit to introduce resistance. Before beginning the work it is essential to determine the polarity, and this is accomplished by the use of a compass needle. The magneto magnets must next be marked north and south respectively before there is any opportunity of reversing the process by confusing the poles.

To use the apparatus it is said that it is only necessary to place the magnets with their opposite poles in contact with the cores, until they have absorbed sufficient magnetism to enable them to sustain a weight of 10 pounds, after which they are ready to be replaced on the magneto. In the sketch the magnet to be treated is represented by the inner member.

While no doubt the process and apparatus described above is practical the best plan perhaps is to have the maker



A British Device for Remagnetizing Magneto Magnets.

of the magneto remagnetize the magnets, he having special equipment for such work and exact knowledge of how to do it.

PISTON HEAD "BLOWS OFF."

(J. P., Tamaqua, Penn.)

I have a 1914 model Krit car and have had much trouble with the piston head blowing out. Please state the cause and what restoration to make? Please inform me of the setting of a Stromberg carburetor?

I assume that what you describe as the piston blowing out is really the blowing out of the cylinder head gasket, which is due to the fact that the cylinder head bolts are not sufficiently seated to make a perfectly gas tight joint. If the engine is a detachable head type, that is, the cylinder head is removable, there should be a copper-asbestos or liquid gasket between the engine block and the head. The head is retained by a series of cap screws. If you will examine the holes in which the cap screws are seated you will probably find that there is more or less carbon in the bottom of one or more of them. This carbon may have been solidified by screwing in the screws and to such depth that the ends of the screws "bottom" and a tight joint cannot be made. If you will take a breast drill and bore out the carbon, and blow out the holes, the screws can be turned down solidly. Practically the same result can be obtained by placing washers under the heads of the screws, but the better way is to fully seat the screws without using washers.

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can be bought at the same price? They overcome all Engine troubles, fire where others fail and Add Power to engine. Any length point desired made to order. Try them and you will use them always. Make a trial and save money. \$1.00 each, 6 for \$5.00.

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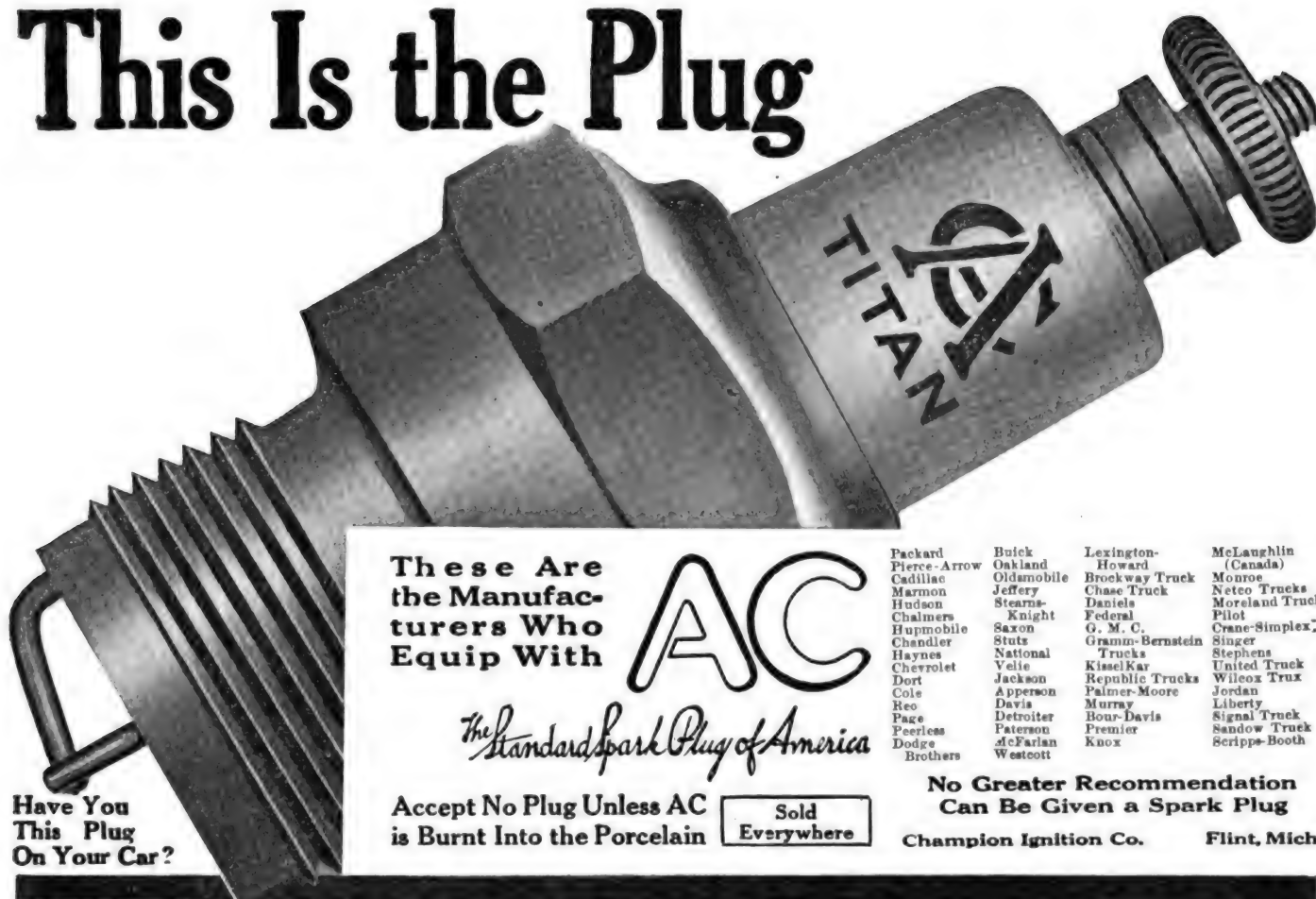


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Hupmobile	Saxon	G. M. C.	Crane-Simplex
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Haynes	National	Trucks	Stephens
Chevrolet	Vellie	Kissel-Kay	United Truck
Dort	Jackson	Republic Trucks	Wileox Truck
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Peerless	Paterson	Premier	Sandow Truck
Dodge	deFarlan	Knox	Scripps-Booth
Brothers	Westcott		

Have You This Plug On Your Car?

The adjustment of a Stromberg carburetor is made first by setting the gasoline level at $\frac{3}{8}$ inch, which is done by turning the knurled nut over the float needle. To adjust the low speed, turn up the knurled nut under the poppet valve until the poppet valve barely seats. To adjust the high speed, turn down the knurled nut on top of the short spring until there is no compression on the spring, and the spring is free to move up and down $\frac{1}{16}$ inch. This will give a very good adjustment and the engine ought to have good power and be economical of fuel if it is mechanically in good condition.

A GOOD VARNISH FOR COPPER.

(C. E. D., Dallas City, Ill.)

What is a good preparation to put on copper tubing to prevent oxidation? I have discovered that the tubing on my car corrodes when we are near the salt water during the summer.

A satisfactory varnish for copper tubing can be made by making a mixture of one part each of carbon disulphide, benzine, oil of turpentine and hard copal and two parts of methyl alcohol. Several applications of this should be made, allowing each coat to dry thoroughly before applying another.

HOME MADE BLOW OUT PATCH.

(G. F. T., Pine Bluffs, Ark.)

I have read somewhere that good service can be had from an old tire by fitting a smaller sized shoe inside. Is this practical and how can it be done? Can you also tell me how to make blow-out patches from an old shoe?

Some motorists have tried the experiment of fitting small sized shoes inside old tires, as you describe, and have claimed to have obtained satisfactory results. The writer, however, is of the opinion that it is better to fit a new shoe, which will be more satisfactory in the long run. However, if you wish to try it, select a shoe that is in fairly good condition and cut

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off the bead and skive the edges; that is, cut them on a slanting angle. Care must be exercised that no rough or sharp edges are left to come in contact with the inner tube. If a larger liner is utilized a section may be cut out, taking care to make perfectly fitting ends. The real knack is to insert the inner tube so that it will not be pinched when the outside shoe is being placed on the rim.

Blow-out patches are made in a similar manner, skiving the edges of the section. It is advisable to reduce the thickness of the material by removing the rubber, so as to prevent undue strain on the inner tube. It is somewhat of a task to prepare these patches, and inasmuch as ready made patches are comparatively inexpensive, the writer advances the opinion that you will find it more economical and satisfactory in every way to buy them.

CONSTANTLY LEAKING RADIATOR.

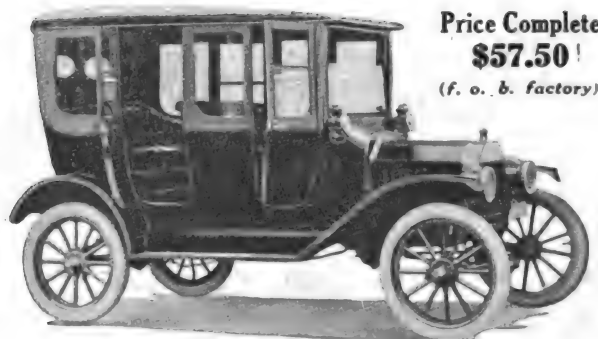
(W. E. M., Ithaca, N. Y.)

For a long time I have been having trouble with a leaky radiator. I have had it repaired several times by a man who claims to be an expert, but after it is replaced on the car it will soon start leaking again. The tinsmith states that he tested the radiator under pressure and that something must be wrong with its mounting. Can this be possible?

If the repair was thorough the trouble is probably due to the radiator being subjected to stresses and these may be the result of several influences. It is possible that the leak may be due to the frame springing or being broken. The writer recalls a case in which when the side boards on the frame were removed the frame was found to be broken, which allowed it to compress the radiator supports. After welding the frame and repairing the radiator, the trouble was eliminated.

Examine the frame carefully and also the radiator supports. Remove the radiator and test these members for play. It may be possible that undue vibration is set up. If the ra-

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\$57.50
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Fairfield "Six-46" - - - **\$1375**

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diator is supported at the bottom by a band and locked by studs, insert a strip of leather or similar material to counteract the vibration. This method has been known to end radiator troubles such as you outline.

SIMPLE METHOD FOR TESTING COIL.

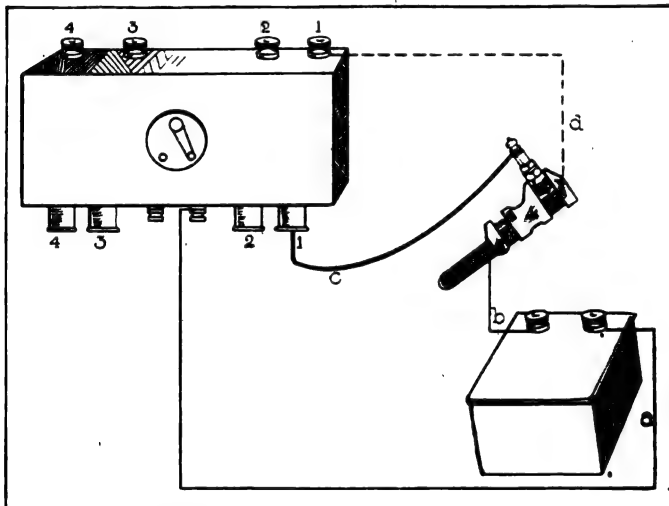
(A. B. N., Vicksburg, Miss.)

Can you tell me an easy way of testing a high-tension coil of the four-unit type without placing it on the car and connecting up with the spark plug and other wires? My coil is not working satisfactorily.

The coil may be tested without installing it on the car and making the connections you mention. In our sketch is a suggestion of a simple method that has been proved satisfactory. It consists of using a battery, four wires, a spark plug and an ordinary monkey wrench. It will be noted that two wires are secured to the battery terminals, one to the positive and the other to the negative. The wire designated in sketch by A is led to the battery terminal of the coil and the switch lever is thrown to the right to make a connection.

The other lead, B, is attached to the wrench, which serves the same function as the frame of the car; that is, of a ground. The spark plug is next placed in the jaws of the wrench and the latter set, taking care that the terminal of the plug does not come within an inch or so of the metal of the tool. The secondary wire from No. 1 coil is then led to and secured to the plug in the usual manner.

Next secure one end of a piece of wire to the primary



How to Test High Tension Coil While It Is Out of the Car.

terminal of the No. 1 unit, which is also connected through the secondary lead to the plug. The free end of the wire indicated in sketch by D is now touched to the wrench, completing a circuit. If the vibrator is adjusted properly and the coil in good condition, a spark will be seen at the gap of the plug. Each unit may be tested in a similar manner.

It is important while conducting the test to make sure that a path for both the primary and the secondary circuits is provided. That of the secondary circuit is secured through the shell of the plug, the wrench and the ground wire to the battery. Care should be exercised in testing any coil, for if the spark is required to jump too great a gap the windings are liable to be broken down in the operation. It also should be remembered that a spark loses much of its size when in a cylinder under compression and in testing a coil this must be taken into consideration.

PARTS FOR ORPHAN CARS.

(J. P. N., Clinton, Conn.)

What company has parts for cars which are not being manufactured now? I saw a notice in your magazine some time ago.

The company you no doubt have reference to is the Puritan Machine Company, whose address is 415 Lafayette boulevard, Detroit, Mich. This company supplies such parts at reasonable prices.

THE AUTO SHOW-

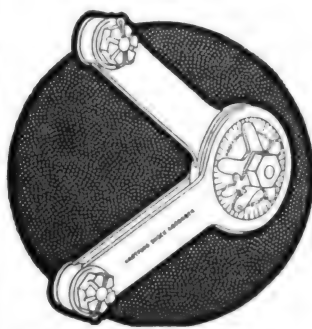
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We will demonstrate in a *practical* manner, just what you may expect from

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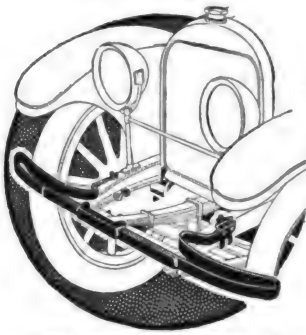
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400,000 car owners use it to make their motoring doubly comfortable. Affords ideal control over present type of active, resilient automobile spring. Absorbs road jolts, jars and vibration, with the result that car rides so smoothly over all roads that its use insures lessened cost of upkeep.

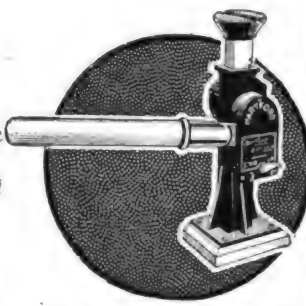
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More than mere bumper. Bump-absorbing; shock-absorbing. Resilient—it gives before the blow. Two powerful, unbreakable loops of spring steel save the car it guards from all possible damage through collision. A beautifier. Fits any car. Bolts on—no cutting or drilling.

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Send today for a chart that will specify the exact grade of oil you need for any engine. It is the best information you can have, and it's free for asking.

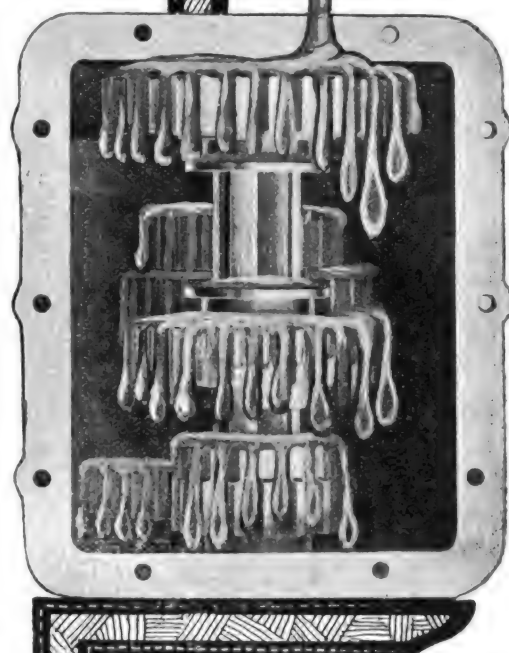
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It fully protects all the gears.

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AC plugs are regular equipment on the cars listed in the opposite panel—

They met the tests. Don't experiment. These leading manufacturers have done that for you. Follow a safe lead. Use the plug with AC burnt into the porcelain.



AC Spark Plugs are standard equipment on the following cars after eliminating competition.

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Chase Truck	Republic Truck
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ACCESSORY AND GARAGE JOURNAL

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1917 Show Issues

—OF—

THE AUTOMOBILE JOURNAL

The most important editions
of the year, covering each of
the three big national dis-
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New York Show

(Held Jan. 6-13.)

Advance Number Review
December 28 January 10

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Prest-O-Lite

At The New York Show

Our space will be of vital interest to the entire automobile industry—to manufacturers, dealers and motorists.

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The Prest-O-Lite Battery is the result of years of effort, by the world's oldest and largest automobile lighting organization, to produce a battery that would measure up to the high standard of Prest-O-Lite Service and better answer the exacting needs of the motorist. There is a Prest-O-Lite Battery of correct size for every make and model of car—backed by a country-wide system of service that is of **real value** to car owners, dealers and manufacturers.

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The Prest-O-Lite "gas tank" has more uses, more possibilities, than you perhaps realize. Many of the newer uses for Prest-O-Lite—"The Gas of a Thousand Uses"—will be shown for soldering and brazing, oxy-acetylene welding and cutting, heating and lighting. Do you know, for instance, that there are more acetylene blow-torches in use today than there were motor cars in the days when Prest-O-Lite was the only practical light for automobiles?

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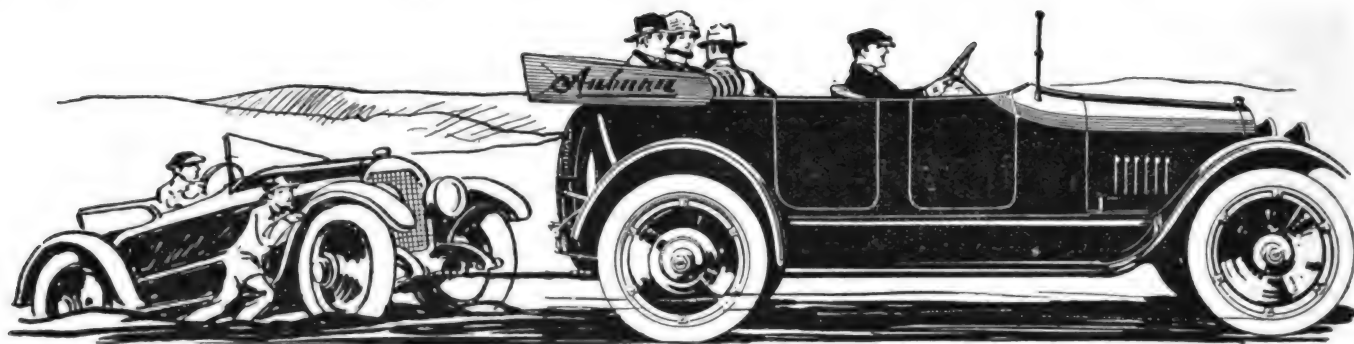
DEALERS—The Prest-O-Lite proposition means more to you today than ever before. If you cannot call at our exhibit, write for details of the Prest-O-Lite Battery proposition, also learn how Prest-O-Lite dealers are finding new customers for the sale and exchange of Prest-O-Lite cylinders.

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Branches and Charging Plants in all Principal Cities



Out of the Rut!

A LWAYS a pioneer, Auburn never followed the beaten path—never was content to manufacture a car that would have been good enough for most manufacturers. Instead it has produced year after year a car that owners agree is the "Most for the Money."

And the Auburn selling plan isn't "rut-worn" either. Instead it is based on a safe, progressive, live and let live basis, a policy that enables every Auburn dealer to make money and build up a permanent business. This accounts for the loyalty of Auburn dealers, and the eagerness of other dealers to secure open territory. Auburn has pulled many a dealer out of a rut.

Auburn

LIGHT SIX

THE MOST FOR
THE MONEY
\$1145

The Auburn line is complete—the performance of Auburn cars is a definite, known quantity. It's manufacturers enjoy a reputation of eighteen years of successful manufacturing—and more—of giving the dealer a square deal.

At the coming automobile shows you will see many new cars—new in design—new in fadish lines—new in every way. Many will doubtless make good, but why take the chance? Why gamble?

Auburn offers to dealers a proposition that gives what it promises.

No dealer ever gambled one penny when he secured the Auburn agency. He gets a definite value. His success is assured and his profits are assured.

Write or wire for the Auburn plan. Learn first hand why the Auburn never disappoints. Why Auburn dealers are loyal.

Why you should have the agency for the Auburn in your town.

Think this over. Then write and be shown.

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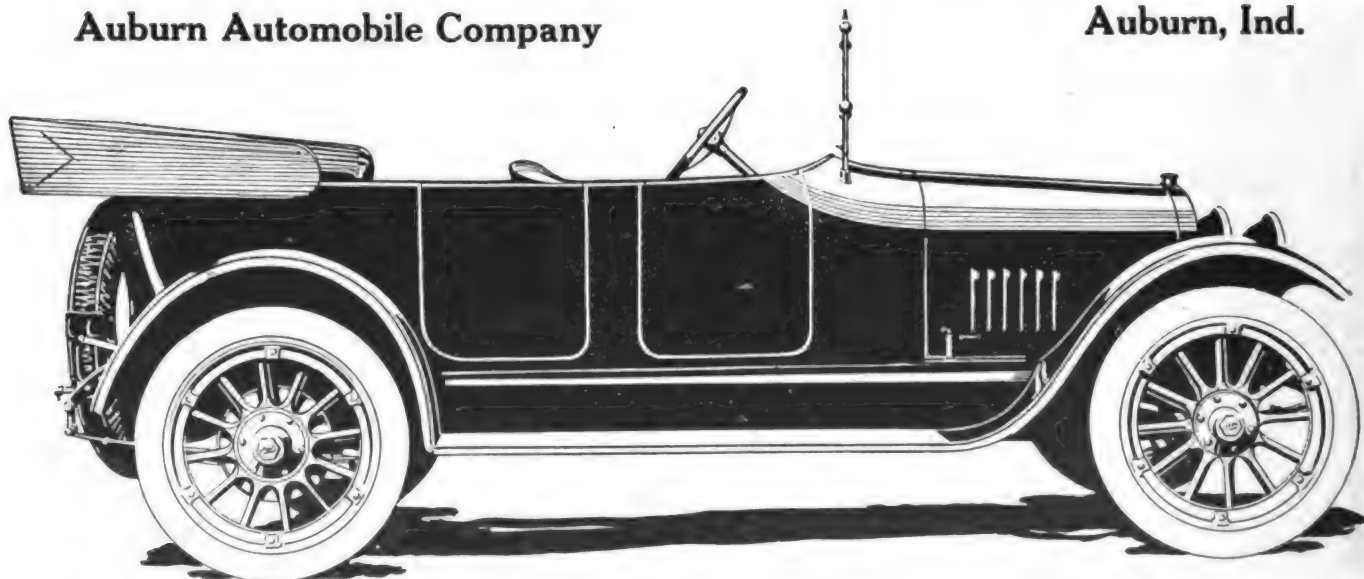
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SEE THESE HANDSOME CARS AT THE SHOWS
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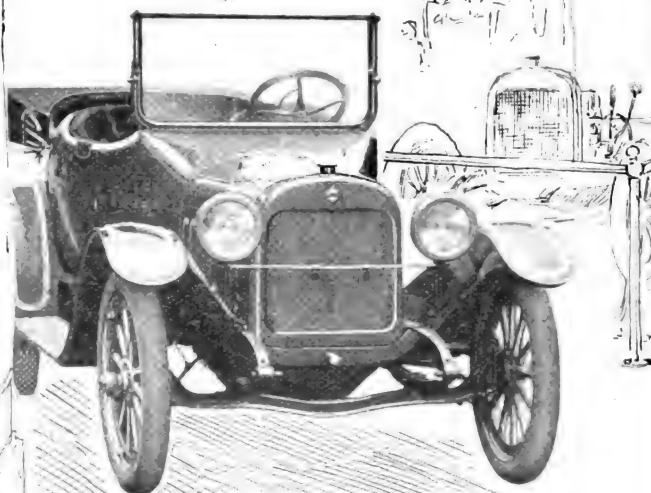
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Inter-State

Space B-8
First Balcony
NEW YORK
SHOW



Continuous Profit Demands a Permanent Standard of Extra Value

Primarily, the Inter-State is built to return a legitimate profit to the builders.

We are thoroughly conscious, however, of this one verity—that we cannot maintain this profit continually, if our cars do not offer a definite assurance of quality and service to the buyer.

For the past three years, Inter-State owners have proved that we are consistently upholding this fundamental principle of successful business.

Today the extra value of Inter-State cars is greater than ever, because every unit of Inter-State construction is worth more.

Together with our beautiful exhibit at the New York show we will also show the latest, signed, service reports from owners all over the country.

If you are interested in building up a business of lasting and profitable duration, the message of these owner reports is vitally important.

If you can not visit the New York show, write today for our new booklet, "A Message from Owners." It contains the results of our recent investigation among our owners. It's valuable information.

Inter-State Motor Company
 MUNCIE : INDIANA

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AUTOMOBILE JOURNAL

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Ten Cents
a Copy

VOL. XLII.

DEC. 25, 1916.

NO. 10.

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Treasurer - - WILLIAM H. BLACK

Secretary - - - - D. O. BLACK, JR.

Published the 10th and
25th of each month by the

AUTOMOBILE JOURNAL PUB. CO.

Times Building, Pawtucket, R. I.

ONE Billion Dollars! That is the mark established by the motor car industry during the year 1916 in point of valuation of sales of pleasure cars and trucks. More than 1,600,000 cars were absorbed by the American buying public, and yet, as great as is that sum, there is every indication that 1916's record will be greatly exceeded in 1917. The industry was never in as healthful a condition as it is today, and it is gaining strength as the economic benefits of motor vehicles are becoming more widely recognized.

AND This Mark was reached despite the several adverse influences that were felt during the year, the chief of which can be traced back for their causes to the European war. The battles on the Continent have adversely influenced the industry in the United States by creating an abnormal demand for steel and other materials, consequently forcing up the prices and as well as making it difficult to obtain sufficient supplies. The manufacturers have had a very hard struggle during the war, not only to get materials, but to secure freight cars in sufficient numbers to take care of their daily shipments.

IN OVERCOMING these obstacles to the great extent they did the manufacturers as a class have exhibited again that they are the keenest and sanest class of business men ever in control of such a tremendous industry. While every other business was obliged to increase the prices of products shortly after the beginning of the war, the motor car makers were able to stave off that move until within the past few months, and then their increases were only sufficient to cover the actual advanced cost of manufacture.

THE Outstanding Features of 1916 in motordom are the record production, and sales, the expansion of the plants and the large numbers of mergers of concerns, the unprecedented earnings and dividends declared, the volume of exports, and the development of the domestic demand. Increased prices have no place in this record, for they are assuredly only temporary, while the other factors are permanent. In the commercial car field, the notable features are the wonderful growth of sales of motor trucks and the general interest in agricultural tractors.

AS Regards Cars themselves there has been no great general change in design though, as will be seen in the story on page 21, several novel ideas in power plants have been introduced. Analysis of the specifications of all the gasoline pleasure cars for 1917 presented in this issue shows that the four and six-cylinder models divide honors, each averaging 42.65% of the total. The eights have a percentage of 11.37, while the 12s are estimated at 3.33%. The average retail price of all cars is \$1662.

THE Specifications presented in this issue make this number one of the most valuable feature issues of the year, and the magazine should be kept handy for future reference. You will frequently have occasion during the next year to refer to the information it contains, especially the specification data about the cars. Extra copies will be difficult to obtain, as past experience has shown that this edition is always quickly exhausted. When reading page 37 please be charitable in your criticism of the abuse of the English language in using the word "Attained" when "Obtained" was intended. This is a typographical error.

BARRETT MOTOR STARTER

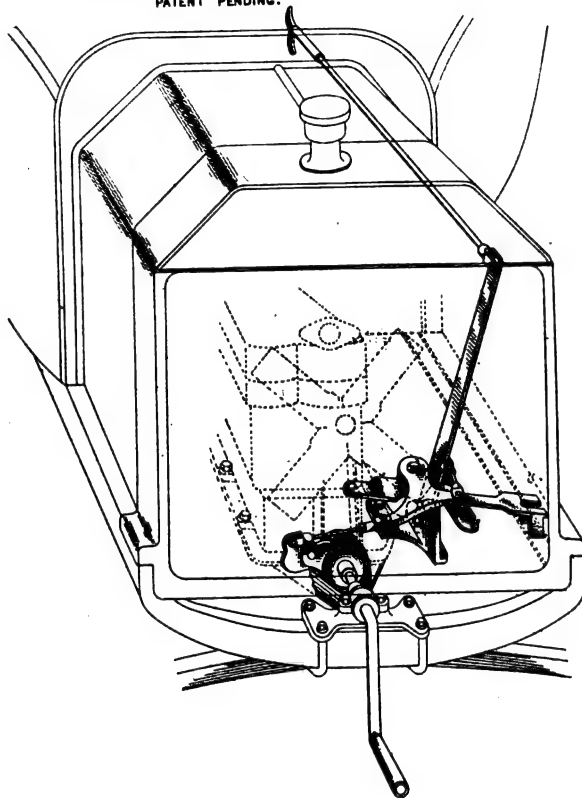
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**SIMPLE IN CONSTRUCTION
NOTHING TO BREAK**

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It cannot get out of order. It will last longer than the car.
No Pulleys, Cables or Chains to stretch, kink or break.
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Mechanically Right.

Operated from the seat.

Starter completely out of sight.

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(Distributors Barrett Motor Starter)

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Giant Searchlight

1917 MODEL



List Prices:

With Mirror \$6

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GIANT SEARCHLIGHTS are a high-grade Culver-Stearns product—a guarantee of quality, appearance, service and efficiency. The design has been developed to make these lamps superior to all others, not a luxury, but a necessity because of their utility and convenience for every car owner.

They are strongly made, project a strong light, and are sold with or without a detachable mirror that is adjustable so that the driver can locate it wherever desirable.

The highly-finished reflector is brass, silver-plated over nickel; the steel outside shell is black enameled; the brass rim retaining the glass is heavily nickel plated, and the bracket is pressed steel, of great strength.

The bracket is constructed to direct the lamp from any position and it is carefully balanced so that it will remain wherever set. The switch, uniquely constructed, is operated by the handle. There is no button to break or lose.

These lamps are furnished with "Mazda C" (gas-filled) bulbs only.

Catalogue and Price List at Request.

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STEAM CAR

Approaching the Ultimate

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Abner Doble has done for the Steam Car what Edison has done for Electric Light.

He has refined it—eliminated its original drawbacks and developed its well-known advantages.

The Doble Steam Car is by all odds the greatest step that has yet been taken toward the ultimate car.

Abner Doble Has Amazingly Simplified Motor Car Construction—There are just 11 moving parts in the Doble power plant—no clutch—no transmission—no complicated multi-cylinder motor.

Nothing but a simple little engine geared direct to the rear axle—and a compact, dependable, highly efficient steam generator under the hood.

He Has Produced a Power Plant of Almost Unbelievable Flexibility and Power—The Doble Steam Car will creep along at one mile an hour or less—and jumps to 60 miles an hour in fifteen seconds—an achievement that has never been equaled by any other car.

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For Literature, Write

General Engineering Company, Detroit, Michigan.

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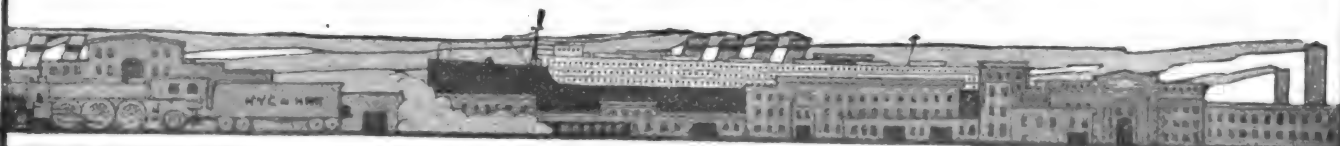
The pressure of a small foot pedal operates the hydraulic brake.

That is all there is to it. It is easier to control than an electric.

The Doble Car is a Demonstrated Success—Every claim made for the Doble Car is based upon actual performance.

Doble Test Cars have been in operation for three years and have been driven over all sorts of roads, in all sorts of weather—One of them has gone over 40,000 miles—yet is as staunch and trim as it was the day it left the shop—The engine has never been overhauled—The valves have never been reground.

The Doble Car is the nearest approach that has yet been made to the car of our dreams—the ultimate car.



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Report

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The Touring Car at \$695
the Fleur-de-Lys Roadster at \$695, the Sedan at \$1065,
the Sedanet at \$815—all will be on exhibition.

"The Quality Goes Clear Through"

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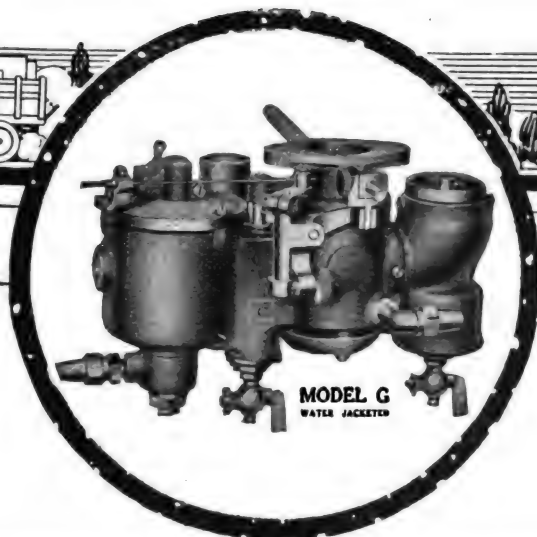
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Satisfaction"**



**"Greater Power,
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Economy"**

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Everywhere*

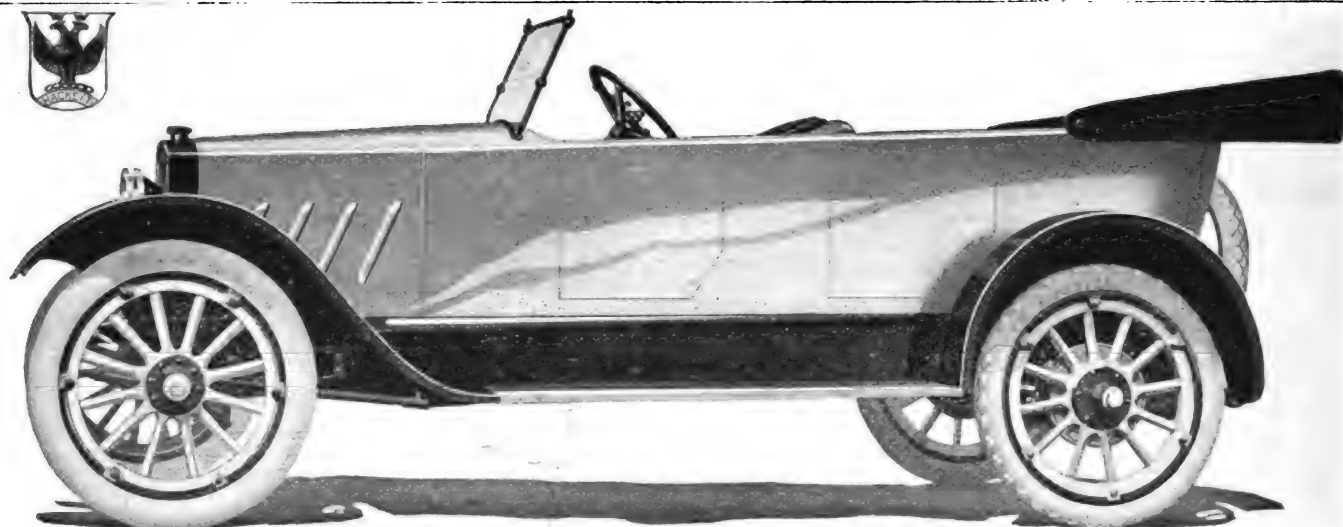
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HACKETT

ULTRA-FOUR

A Prideful Car, Distinctively Different

The average motorist—the man who is not possessed of an unlimited purse—is able to secure in the Hackett Ultra-Four as distinctive, distinguished and individual a car as any amount could buy. Pride of possession is dominant. It has the trim, racy lines of a fast speed-boat, coupled with the solid comfort of an easy chair.

\$888

f. o. b. Jackson.

Complete equipment includes one man mohair top; 2 piece rain vision windshield. Instrument board in cowl, equipped with lighting and ignition switches, ammeter, speedometer, oil indicator, carburetor adjusting dial and instrument light.

Thousands of buyers have been waiting for a car like the Hackett, that would give them relief from the dreary sameness of design that permeates the whole field.

The Hackett is built by men who have made good cars for years—and are producing their best car today. It has a spring suspension that must be tested to be appreciated—a room and comfort that astonish the buyer accustomed to ordinary cars.

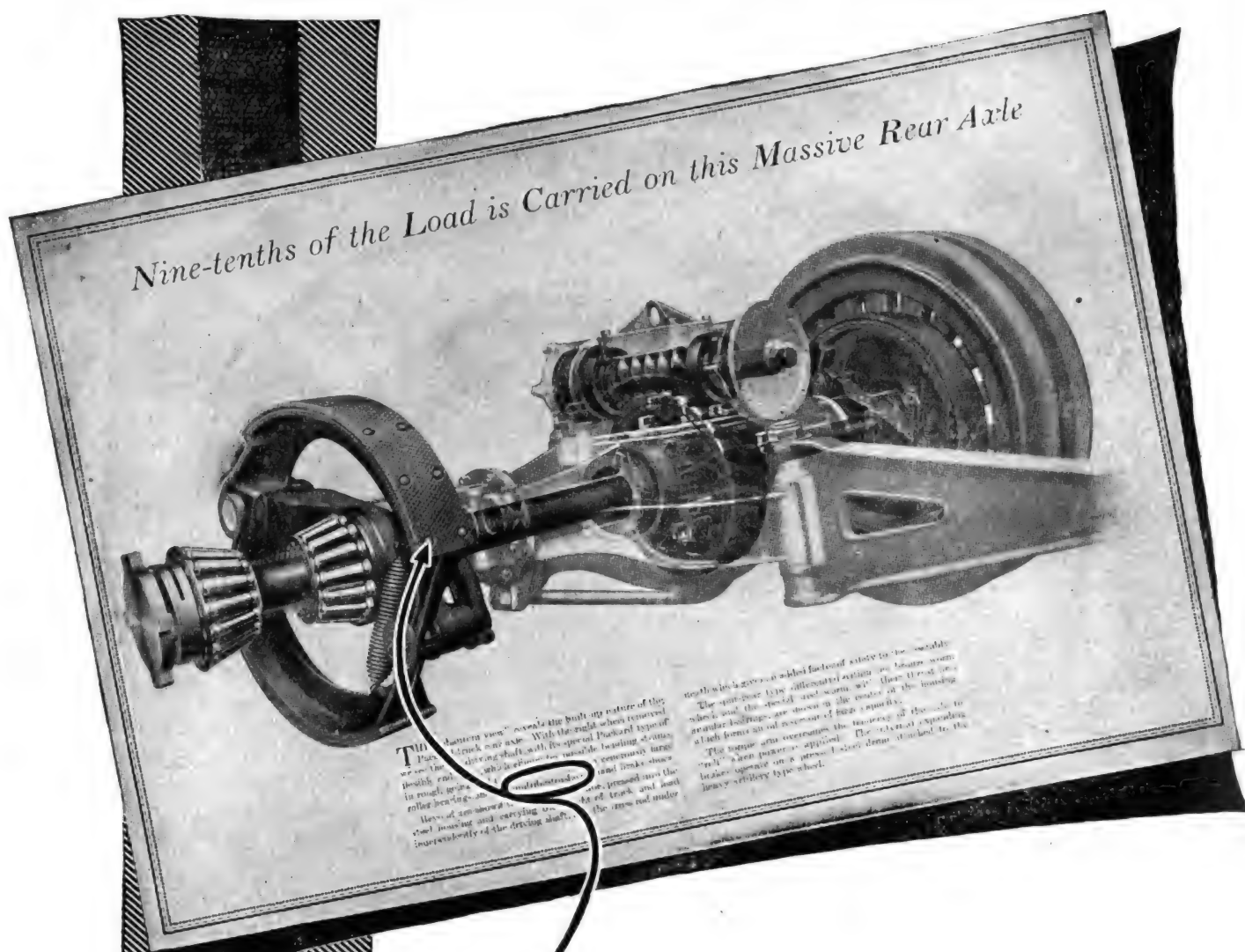
A few of the details of the car are given on this page. It is impossible to find space for many of them. But we shall exhibit at both the New York and Chicago Shows. And we want dealers and public alike to see and judge the car. Some of the shrewdest dealers in the country have already seen it and promptly arranged for agencies.

HACKETT MOTOR CAR COMPANY

127 PARK AVENUE

JACKSON, MICHIGAN

DEALERS: Better write at once for details. The Hackett is a car that sells against the entire field.



The massive rear axle of the **PACKARD** truck may truthfully be said to carry nine-tenths of the load. With equal truth—the massive inherent strength of the small strip of multibestos guards the safety of the entire load.

MULTIBESTOS

TRADE MARK REGISTERED

The tribute implied in the above illustration is full repayment for our years of constant effort in the determination to produce the best possible Brake Lining.

Such an endorsement is also a guarantee of quality to the growing army of Multibestos users.

Again we say: **JUDGE MULTIBESTOS BY THE COMPANY IT KEEPS.**

Standard Woven Fabric Co.
Factory : Walpole, Mass.

N. Y. Branch & Export Office, 1779 Broadway
 Boston, 175 Massachusetts Ave. Philadelphia, 1309 Race St.
 Chicago, 1432 Michigan Ave. Atlanta, 6 West Harris St.

(When Writing to Advertisers, Please Mention The Automobile Journal.)



So much more for the money

This car sells itself to anyone who starts out to get the most for his money in a good, big, roomy, five passenger car.

Comparison proves a plain case to anyone who cares to know.

You don't have to be an expert or have any special knowledge to determine the big extra value you get in this car.

Its advantages stand out so boldly that they cannot be overlooked in a comparison with any car selling for \$795—or for a great deal more.

You get more power—35 horsepower motor—more than 250,000 in use.

You get more room—112-inch wheelbase.

You get greater comfort—long, 48-inch cantilever rear springs and 4-inch tires.

You get greater convenience—electrical control buttons on steering column.

You get bigger, safer brakes—service, $13\frac{3}{8} \times 2\frac{1}{4}$; emergency, $13 \times 12\frac{1}{4}$.

You get better cooling—you never heard of an Overland overheating.

This is the biggest and best car we have ever been able to sell until now for less than \$1000.

In fact, it's a thousand dollar car which the economies of our enormously increased production enable us to sell for \$795.

If you want the most for your money in a big, comfortable, roomy five-passenger car of long proven mechanical superiority—here it is.

And back of the car is the largest and most successful automobile concern in the world that produces cars of this size and class.

See the Overland dealer in your nearest town—he will gladly show you the car—demonstrate it—give you a prompt delivery—and render prompt efficient service as long as you own it.

Now is the time to buy—there will be plenty of good driving weather.

Same model, six cylinder—35-40 horsepower—116-inch wheelbase, \$925.

The Willys-Overland Company, Toledo, Ohio

"Made in U. S. A."

5 Passenger Touring Car

\$795

f.o.b. Toledo

THE Automobile Journal

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DECEMBER 25, 1916.

NO. 10.



New York Show Supreme

All Records for Motor Car Exhibitions Will Be Surpassed This Year at Grand Central Palace

WHILE half the world writhes in the throes of war, America is intent upon her great industries, expanding them beyond the dreams of the most optimistic of prognosticators. In no industry is this expansion more noticeable than in the manufacture and distribution of motor vehicles, and at no time can the magnitude of the industry be determined so accurately as at the great New York National Automobile Show of 1917, the 17th annual event to be held under the auspices of the National Automobile Chamber of Commerce.

When the curtain was lifted on the New York show in 1916 it was the consensus of opinion that the pinnacle of the motor car industry and of the motor car exhibitions had been attained. This year, however, it will be found that the records of 1916 have been far surpassed in all points by which the growth and condition of the industry is measured. Grand Central Palace, the scene of New York City motor car shows, will be filled overflowing with all the representative models and makes scheduled for 1917. The show will be a revelation of what is in

Prices, Styles and Specifications of All 1917 Models on Pages 33-50.

store for motordom, and will be a greater spectacle than has ever been staged in any part of the world.

The World's Greatest Show.

The capitals of Europe have been the scenes of some large and beautiful exhibitions in the past, but this year they must relinquish the honor of holding the greatest and most representative to the New York Show. All the exhibitors, of which there will be more than a hundred makers of motor pleasure cars, they showing about 500 car and chassis models, will be American manufacturers. The prices of the cars range from \$395 to \$10,000, with at least one chassis selling for \$6000.

While motor cars will have the best positions for display, the exhibitors of accessories will vie with them in the in-

Automobile Chamber of Commerce, reported that there were 325,000 paid admissions, which represented an increase of about 33 per cent. over the attendance of 1915. This is a far cry from the few thousands of people, many of whom were sceptics, who visited the first collected display of motor cars in this country that was held in Madison Square Garden in 1900.

The new home of New York motor car exhibitions, Grand Central Palace, is ideal for the purpose, its splendid Doric and Corinthian columns lending themselves exceedingly well as the foundations of auxiliary decorations. On the main floor 20 imposing Corinthian columns of marble are grouped to form a central court, the columns supporting a cornice that forms the railing of the second or mezzanine floor. On this floor are 119 Doric columns, which, together

taining flowers of varied hue are to be stationed at the bases of the giant marble columns on the main floor, and from these boxes trailing vines will twine around the columns, ending at the top in huge floral baskets of Roman type.

Striking Window Decorations.

The treatment of the windows will be quite unique. A frame of Colonial design will be installed at each window on the main floor and behind it will be scenic paintings, giving the spectator the impression of looking out upon beautiful landscapes. Large mirrors will be placed between the windows, and at the rear of the building huge draperies will give a rich background effect to the whole decorative scheme.

Bay trees and flowers will adorn the lobby, while the walls will be hung with

Col. George Pope,
Chairman of
Show Committee
of New York and
Chicago Shows.



Alfred Reeves,
General Manager
of the National
Automobile
Chamber of Com-
merce.



Grand Central Palace and the Men Who
Manage the World's Greatest Show.



Wilfred C. Leland,
Vice President of
the N. A. C. C. and
Member Show Com-
mittee.



S. A. Miles, Manager
of National Auto-
mobile Shows at New
York and Chicago.



terest compelling exhibitions they will make of their products. More of this class of displays will be made this year than at any other exhibition, the total number of manufacturers scheduled for space approximating more than 225. They will show every conceivable device for adding to the economy and pleasure of motoring—from cotter pins to engines of all types. Many novel and interesting devices are promised.

Attendance is always considered as a point in determining the importance and success of a motor car exhibition, and in this respect the New York Show stands supreme. Those in close touch with the exhibition are confidently predicting that not less than 400,000 people will cross the threshold of Grand Central Palace. Last year, S. A. Miles, who manages the show for the National

with those on the first floor, make a brilliant but not garish architectural setting.

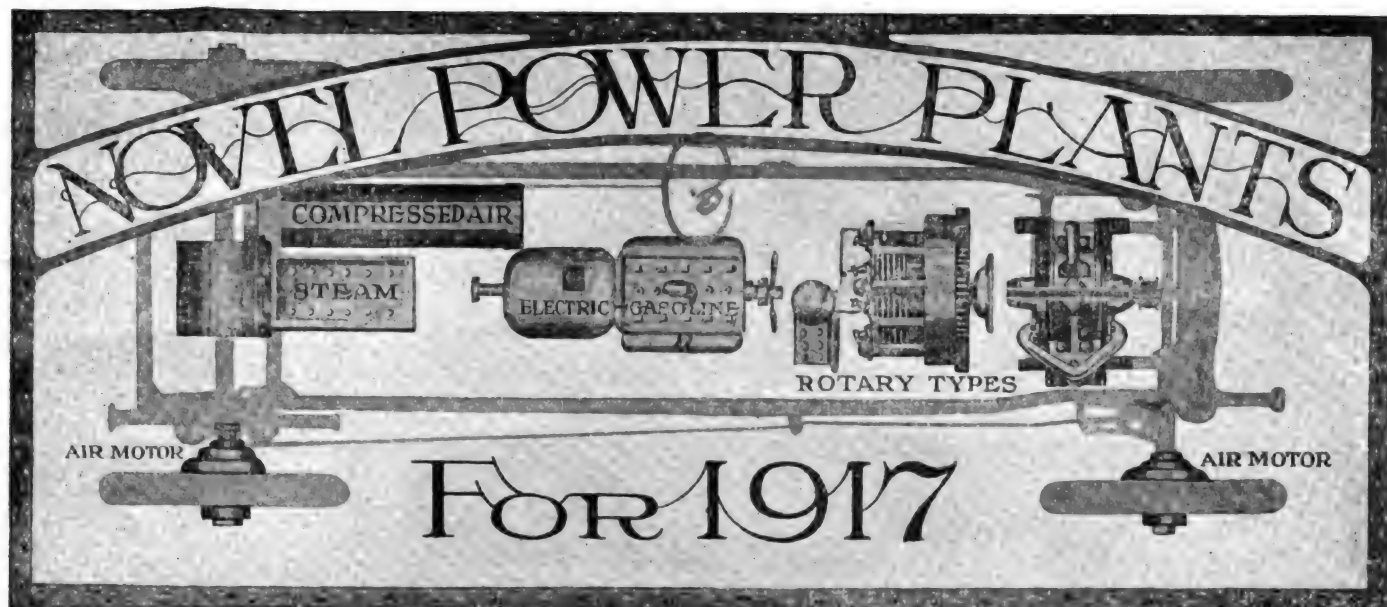
The chief source of illumination is derived from mammoth chandeliers of original design suspended from the ceilings by heavy and ornamental chains. Each chandelier has 18 high power lights hidden behind frosted glass and colored panels that give off a brilliant flare of color.

The Plan for Decorations.

Manager Miles and M. A. Singer, director general of decorations, who planned and executed decorations for the Panama-Pacific Exposition, spent much time in evolving the decorative theme for this year's exhibition, the result being "The Temple of Flowers," in which clinging vines and budding foliage dominate. Mammoth lattice boxes con-

sist of six gigantic scenic paintings. Entering the main hall the visitor will find the names of the exhibitors on signs, the name being in white letters on red backgrounds bordered by gold. The colors of the show will be white and green with red much in evidence. The upper three floors of the Palace will be treated in much the same way as the main floor.

This year's show will be handled by the same group of men who have made past exhibitions so successful. S. A. Miles manages it for the fourth consecutive year. Other members of the show committee who have been actively engaged in planning the exhibition are Colonel George Pope, chairman of the committee; Alfred Reeves, general manager of the National Automobile Chamber of Commerce, and Wilfred C. Leland, vice president of the chamber.



THE old continually gives way to the new. It is the inevitable process that evolution is continually carrying on in Nature, industry and the arts. While it is slow in manifesting itself in mechanical lines, evidence of the slow transition from one set of ideas and principles to new ones is always presented, particularly in motor car construction and practises.

While automobile engineers are more or less conversant with these changes as they are introduced, the motoring public first gets its glimpse of the revolutionary ideas at the big motor car shows. The biggest of all shows opens Jan. 6 at New York and will form the battle ground where most of the unusual and novel designs of 1917 will be first displayed for the approval of the purchaser. Upon him rests their futures and he will decide whether or not the innovation is to become popular.

As a rule the large manufacturers of cars are not quick to adopt the new and radical designs in motors or other chassis components, and this has been more true this year than in the past, the majority of changes being included under the head of minor mechanical changes in the chassis and extensive innovations and changes in body designs. The school of radical design must have its fling, however, and it is good that this enterprise is not stifled—what would a New York show be without models of such radical design that they compel attention and inspection. There have always

been novelties on exhibition, and many of those exhibits that were novelties and attracted the attention and doubts of the engineers several years ago have become incorporated in the accepted practises of the profession and are today in general use on motor cars.

Who is there in the motor trade, no matter how fixed his ideas might be as to what constitutes the proper and orthodox power plant, who would endanger his reputation by prognosticating that 20 years hence the same principle in the gasoline engine will be employed to drive the motor car that our grandsons are to ride about in. This would be foolhardy, particularly in view of the comparatively short past of the motor car and its many changes.

Inventors Have Been Active.

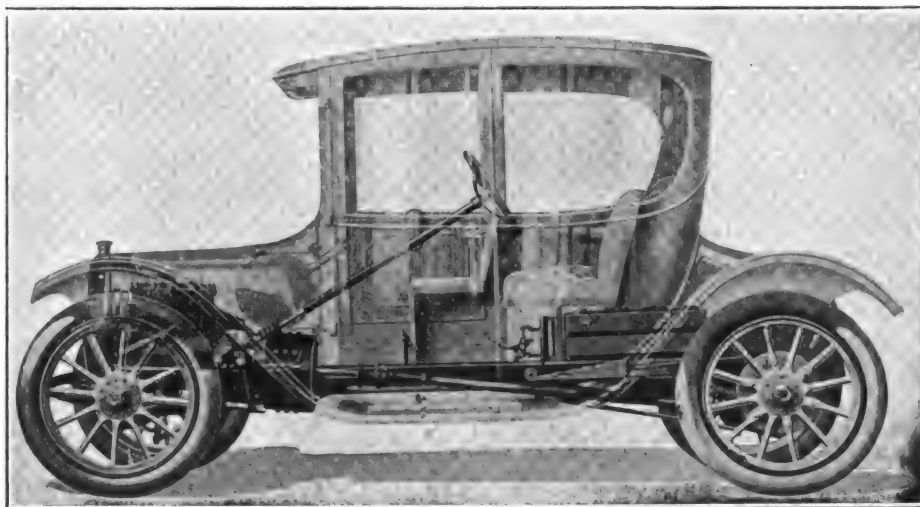
This unrest among the inventors has not been confined alone to those that believe there is to be a millenium affecting the gasoline motor alone, but has effected others who have been working with the idea of perfecting the electric power

plant and the steam power plant. There are others who believe the secret is to be found in combining either gasoline and electricity or gasoline and compressed air.

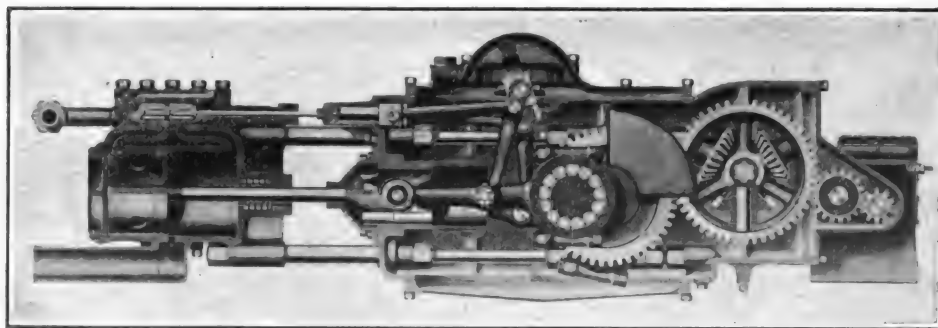
All these different schools of endeavor in the motor industry are represented this year by new and novel power plants which will be offered to the American public for the first time in practical form. In some of these ideas is seen the development of new and radical principles, while in others we find represented only an ingenious and practically new method of applying an old principle so that it will become more efficient. These new power plants in question are not in the embryotic state, nor do they represent the wild undeveloped dreams of fanatic inventors. They are instruments that, to the mind of the creators, have solved problems of locomotion in a practical way. In fact, they have been finished and in operation have convinced sufficient capital to make possible their installation in automobiles that are to be offered to the public.

What success they will have is dependent upon the future, as in no other line of endeavor do men create things the popularity of which rest so much on the public's firmly fixed idea that the "proof of the pudding is in the eating." For this reason also, in the automobile industry, more so than any other, the adage that, "many are called and few are chosen," is gospel.

In the following pages are descriptions of the chief



Phantom View of the Woods Gas-Electric Car.



Doble Engine, Differential and Generator in Unit.

features of seven unusual power plants and cars that are offered for 1917.

The Woods Dual Power Motor Car.

GASOLINE combined with electricity is the novel power combination to propel an automobile incorporated in a car manufactured by the Woods Motor Vehicle Company, Chicago, Ill., which will be one of the features of the coming shows.

The idea of combining the two powers to propel automobiles is not new, but in the Woods Dual Power car the maker has solved the practical solution of the problem and has evolved many refinements and innovations in its application which are extremely interesting. The combination of the two powers results in a car that is very flexible and dependable.

Advantages Achieved.

The demand for this type of car was created through the inability of inventors to evolve an efficient transmission device that would properly proportion the load the gasoline engine was carrying to its speed. By turning the power generated by the gasoline engine into electric current and applying it through a motor to the driving shaft this difficulty is overcome.

On the other hand, the electrically driven car had a very limited operating radius, owing to the limited amount of current that could be stored up in the batteries on one charge and then again the charging facilities were not always convenient and when they were it required a longer stop than most motorists

desire to make before resuming their trip. In combination, however, it will be seen that by carrying the charging station about on the car, in the form of a gasoline engine, which, incidentally, serves as an auxiliary power plant, many of the objections that were present in the operation of the cars with these powers separately, have been eliminated.

The car has now become an electric, truly speaking, with unlimited radius of operation, 40 per cent. greater speed, and with all the advantages of the gasoline car, but without the gears, levers, clutch pedals or other complicated parts.

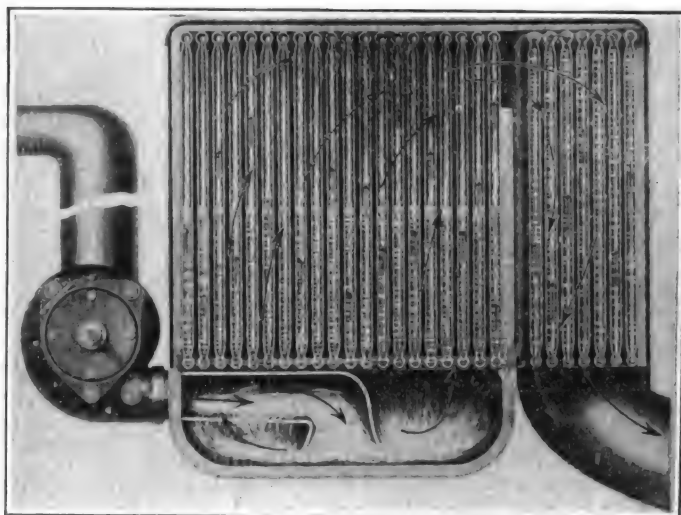
A small four-cylinder gasoline engine, 2½-inch bore by 3½-inch stroke, of moderate speed and developing about 14 horsepower, constitutes the power plant in the Woods Dual Power car. This is connected in tandem with an electric motor generator, specially wound to perform its several different functions. The movement of a lever on the steering wheel connects the gasoline engine with the electric motor generator which cranks the gasoline engine. The power is transmitted through the armature shaft of the electric motor

and the propeller shaft direct to the rear axle. A battery of 24 cells stores up the power when the motor is running as a generator.

Application of Power.

When the gasoline engine is supplying all the power to run the car, the electric motor, without any movement of the controlling levers, can be made to run the car independently as an electric car, or to assist the gasoline engine in propelling the car or to act as a dynamic break. The operator of the car can at all times account for the amount of current stored in the batteries by watching an indicator dial on the dash, and, by slightly changing the relative position of the two control levers, the batteries may be either charged or discharged at any speed from 10 to 30 miles an hour.

By this arrangement the gasoline engine is always developing its maximum horsepower and can rely upon the electric motor for ascending hills or going



Steam Generator and Combustion Chamber of Doble Car.

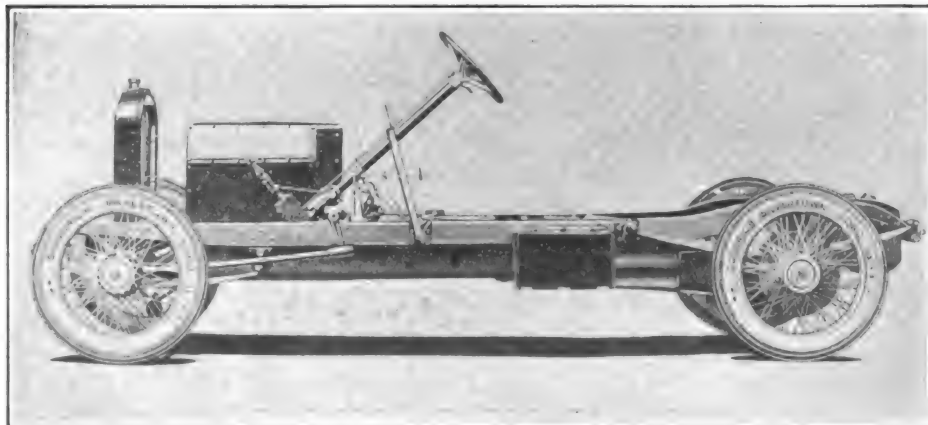
over bad roads where additional power is necessary. Neither can the gasoline engine be stalled, as overloading would cause it to develop its maximum power after which a reduction in speed of the engine would take place and the electric motor would come automatically to its assistance.

There are many other excellent points about the Dual Power car, a complete description of which is prevented by lack of space. It might appear to the layman that an electrical equipment with so many functions to perform might be complicated, but in reality it is more simple and contains less parts than the ordinary electric car.

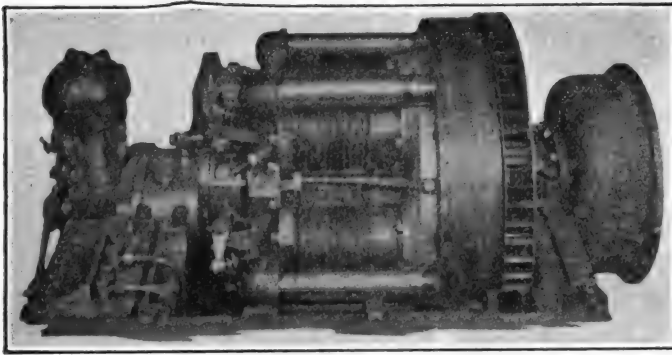
The Woods Dual Power car now on the market is a three-seated coupe and the body is a fine example of high class coach work. The interior has luxurious appointments, including all the modern fittings and equipment.

Description of The Doble Steamer.

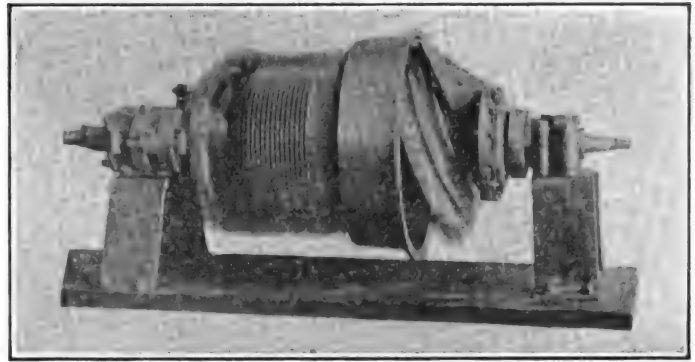
THERE is no machine that stands out so conspicuously in the field of steam propelled cars as the creation of



Doble Chassis Has Appearance of High Powered Gasoline Car.



Eagle-Macomber Five-Cylinder Rotary Engine.



View of Eagle-Macomber Running, Showing Suspension.

Abner Doble of Detroit, which is to be put on the market as the Doble Steamer by the General Engineering Company of that city.

Nine Years to Perfect Car.

Mr. Doble has been working for nine years perfecting his steam car and eliminating the objectionable features that have made that type unpopular with engineers and the automobilists. His efforts were crowned with success, he developing a steamer which on a test of many thousands of miles vindicated his convictions.

The best idea of what the Doble steamer is and what it can do is found in a description of the innovations employed in its construction and operation. Probably the first superiority in the point of order of importance is the new condenser. It is in the form of a regulation radiator, such as would be found in any car, but its importance lies in the fact that it has increased the operating radius of the steam car from a maximum of about 200 miles on one charge of water to 1200 to 1600 miles on 25 gallons of water. The frequency with which tourists had to stop for water in the old steam cars was one of the objectionable features.

Another difficulty in the application of steam power to the automobile, which made the old style steamers unpopular, was the troublesome method employed in igniting the fuel and getting up steam. In the old type a pilot light was employed and it had to be fed under pressure. Two kinds of fuel also had to be

carried, gasoline for the pilot light and kerosene for the fuel. Even when this method of "firing up" worked, it was a question of a number of minutes before a sufficient head of steam was available for starting.

These difficulties have been eliminated by Mr. Doble's new method of firing up. Under the vertical tube steam generator, which sets under the hood in a position corresponding to the engine in a gasoline car, is a combustion chamber lined with refractory material. A spark plug is located at a point where it ignites the kerosene as it is introduced in mixture to the combustion chamber. This is accomplished by turning the starting switch on the steering wheel.

Economy of Steam Car.

With the water in the boilers cold, a sufficient head of steam for starting purposes is obtained in a maximum of 90 seconds. When the car is brought to a standstill there is normally 600 pounds pressure in the boiler. This pressure becomes lessened very slowly and when the starting switch is thrown on again the car will start instantaneously if it has not been standing for more than four to eight hours, according to the temperature of the outside air. Kerosene is the only fuel used and Mr. Doble obtains about 14 miles to each gallon, which would be the equivalent of about 28 miles to a gallon of gasoline, based on prevailing prices. After his fuel had been entirely exhausted during one of the tests there was sufficient pressure remaining in the boiler to propel the car

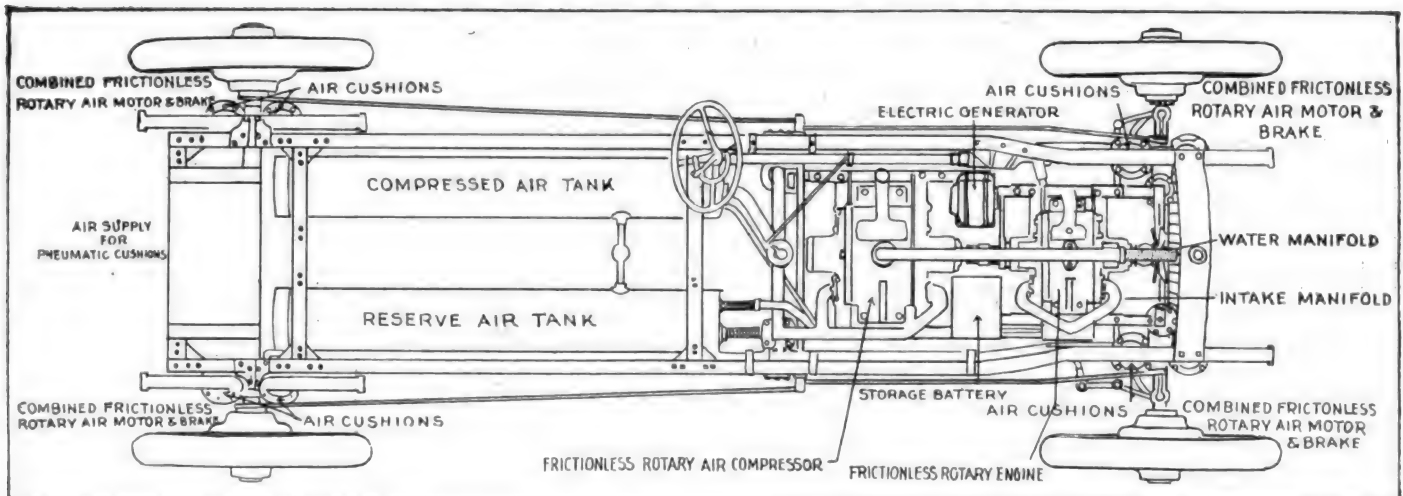
for nearly three miles.

Another improvement made to the power plant is the novel method of lubrication, which seems to be the ultimate in economy and efficiency. The oil is introduced into the steam, which carries it into the engine, lubricating all the moving parts and incidentally serves to spread a thin film of oil over the interior surfaces of the boiler tubes, preventing the formation of scale or rust. The consumption of lubricating oil is about one gallon to every 8000 miles.

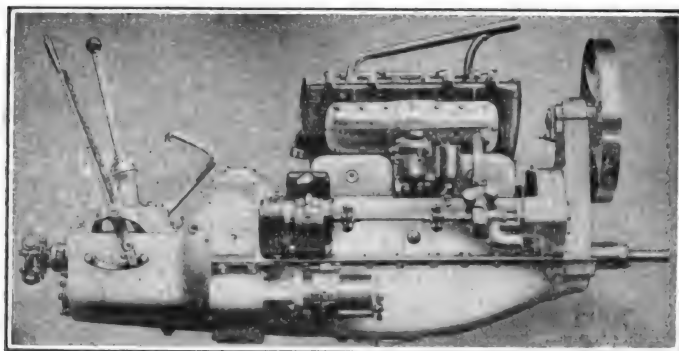
The engine used is a simple, uni-flow, double acting, two-cylinder, locomotive type, with a five-inch bore and four-inch stroke. The steam passes through it from the cylinder head to the centre exhaust port, traveling only in one direction. The engine gives the same number of impulses per revolution as an eight-cylinder gasoline engine with the added elasticity and power derived from steam. There are only 20 moving parts in the whole chassis, 11 of which are in the engine. Gear set, clutch, drive shaft or reduction gears are not required, the crank shaft being geared to the rear axle through a 47-toothed gear running in mesh with a 49-toothed gear on the differential. Even with this gear ratio the engine has enough power to spin the wheels while at rest on a dry pavement.

From One to 80 Miles.

The car's extreme flexibility enables the driver to accelerate from a speed of one mile an hour up to 80 miles, and it can climb any hill where the wheels can secure traction.



Plan of Power Plant in Airmobile, Showing Rotary, Engine, Compressor and Motors.



The 16 Valve Four-Cylinder White Power Plant.

As the exhaust steam is condensed over and over again, there is no exhaust to waste the heat-energy or to make the hissing noise that accompanied the old type of steam cars.

The storage batteries, which furnish the current for lighting and ignition, are charged from a generator that is in mesh with a set of reduction gears driven by the spur gear on the differential. All gears used on the car are always in mesh.

The power is controlled by the hands and the only lever used is that to actuate the emergency brake. The service brake is applied with a lever on the wheel and the engine is reversed by a small pedal.

The body designs are of the highest class, being Holbrook products, and there is nothing in the appearance of the car to indicate that it is operated by steam. It is equipped with wire wheels and has all the appointments of the finest cars.

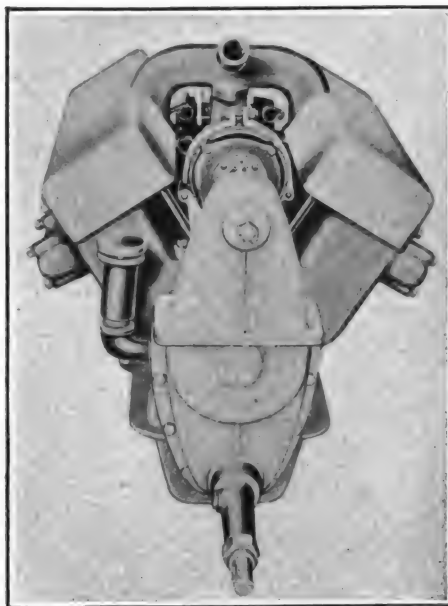
Eagle-Macomber Rotary Engine.

THE motorist with his curiosity aroused to a high pitch upon entering the New York show to see the rotary principle adopted in a practical engine for automobiles, will find it installed as the power plant in the Eagle-Macomber motor car, manufactured by a company of that name in Sandusky, O.

While of the rotary type, this engine, which has five cylinders, employs the same principle of deriving its power as is employed in the regular four-cycle type of gasoline engine, but embodies an idea for transferring the driving power to the shaft that is radical and revolutionary. The construction is also unique, the cylinders being placed parallel and revolving longitudinally about the shaft. Previous types of rotary motors, which were so commonly used in aeroplanes in Europe up to the time of the war, were built with the cylinders arranged radially like the spokes of a wheel with the crank at the hub. The Macomber rotary motor is designed along entirely different lines, the cylinders being set in a circular base at right angles, like the cylinders in a revolver. This method is claimed to have many advantages over the other type of rotary motors, as it does away with the enormous centrifugal force developed when the cylinders are set radially, which means great

strain on the mechanism and difficulty in securing proper lubrication. With this compact arrangement of the cylinders a flywheel effect of sufficient force is obtained. Other objections to the rotary type are eliminated, and air can be efficiently employed as the cooling agent.

The maker claims the engine is ideal for light car work, as 90 per cent. of its weight is used for flywheel effect as



An Engine That Can Be Used Either as a Six or Twelve—the Enger.

compared with approximately five per cent. on the reciprocating types. As none of the bearings receive any direct shock from the explosions, ball bearings are used in the cylinder base and angle plate through which the momentum is transmitted to the shaft. On the ends of the connecting rods are a special type of dumb bell bearings that serve as ends to take the strain and eliminate friction. The entire engine is sustained by two radial bearings on which it revolves, and these are supported on a sub-frame built on the chassis frame.

The motors are

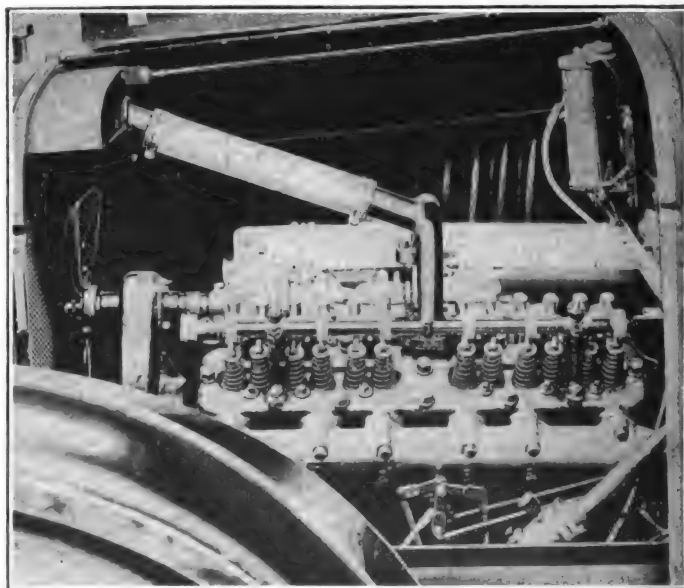
being built in two sizes, one rated at 18-20 horsepower and another at 28-30 horsepower. The smaller size will be used in the roadster model of the Eagle-Macomber car and the larger in the touring model. It is claimed by the manufacturer that through the light weight and superior efficiency of the motors the cars will average from 25 to 30 miles to a gallon of gasoline.

Homer Laughlin Front Drive Car.

IN THE Homer Laughlin car, manufactured by the Homer-Laughlin Engineers Corporation, Los Angeles, Cal., the automobile connoisseur will probably find more to excite his curiosity than in any of the new models to be displayed for the first time. Yet considering the basic principles employed in the power plant, transmission of power, applying the power and in controlling the operation, there is nothing startling to be revealed. Its uniqueness lies mainly in the method of assembly and of applying the power and control.

There are, however, a number of unusual features that are not found on cars of any other make. The chief feature is the method of applying the power to the front wheels, including a novel type of universal, through which the power is transmitted to the wheels; an original type of differential cantilever spring suspension on the rear wheels, which have only a trailing and breaking function.

In the universal joint employed the engineers have overcome the objection formerly met in attempts to apply the power by this means to the front wheels of a car. To successfully employ this principal it is necessary to have the flywheel and the front wheels rotate at the same relative speed throughout each revolution, but by the use of the old type four-point universal this uniformity of action could not be obtained when power



Left Hand Side of the Enger Engine, Showing Detachable Head of the Left Cylinder Block Removed.

was being transmitted through the maximum angle made necessary by turning the wheels, as it has a tendency to jerk at the four points of contact. The Homer Laughlin universal, however, has a contact at eight points and gives a uniformity of rotation within .75 per cent. of normal and this difference is made negligible as it is taken up by the flexibility of the different parts in absorbing the power.

Excepting the brake bands and brake rods on the rear wheels, all of the operating mechanism is under the hood and foot boards. The power plant is a Homer Laughlin eight-cylinder engine of the V type, L head, $2\frac{1}{4} \times 3\frac{1}{4}$ inches. A number of new features are also incorporated in the engine. Removable cover plates at the top, inside the V, give easy access to the valves, which have a diameter of one-half the diameter of the cylinder bore. A special design of splash oil system is employed for lubrication, and the maker claims that it will distribute oil evenly and with absolute regularity at varying speeds.

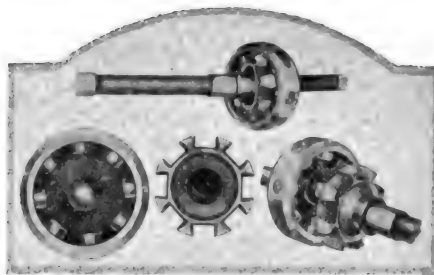
The Special Oiling System.

Small open steel wire coil springs attached to the ends of the connecting rods splash oil on the lower walls of both blocks and a duct goes from the lower side of the bottom ring groove diagonally across through the piston and opens into an oil channel on the upper half of the piston ring, through which oil is forced by the gas escaping past the first rings to the upper periphery of the cylinder.

On a brake test at 2250 revolutions per minute the engine develops 25 horsepower. Instead of being yoked the connecting rod bearings are side by side on the crankshaft. The camshaft and generator are operated by a silent chain. A thermo-syphon system of cooling is employed.

A novel adaptation of the friction disc type of drive is another innovation which calls for attention on the Homer Laughlin. Unlike the old types of this kind of power transmission, it is fitted with an automatic pressure control, which eliminates the confusion experienced by a person on account of the method of control being reversed. The conventional pedal control is obtained through the use of an eccentric connection, giving irreversible application of spring pressure.

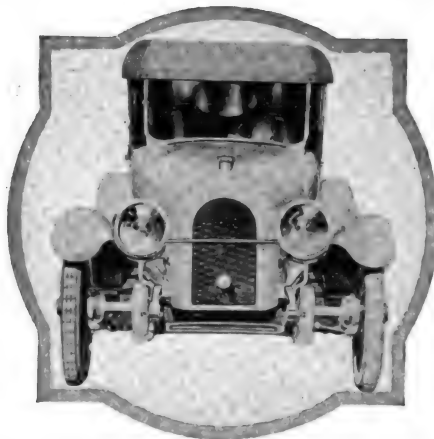
The bronze friction disc employed is of a composition invented by the manufacturer and it is claimed that it eliminates the catching and abrasion of the



Homer Laughlin's Special Universal Joint.

disc. The friction of the eccentric locks the transmission at the correct pressure for running the car in normal speeds, but not for starting, reversing or low speeds on hills. One gear shift lever controls all the speeds and is so applied as to be locked in any of the variable speeds. The power is transmitted from a jack shaft to the front axles by chains enclosed in a case which can be opened at the front for either adjustment or inspection.

There is also a novel arrangement to be found in the application of the springs



How the Homer Laughlin Appears from the Front.

to the rear axle. They are of the cantilever type compounded, the front ends of both parts being attached to the frame on fixed bolts, while they are held together at the centre with two separate toggles. The rear ends are attached above and below the axle respectively. The long member of the top set of leaves being in front and the long member of the lower set being in the rear, the tendency of one part to oppose the movement of the other gives a differential action.

Only a roadster type of the Homer Laughlin is to be built this year and this model will sell for \$1050 f. o. b. Los Angeles, including equipment as follows: Electric lighting, starting, and battery current generating outfit; U. S. L. batteries; double bulb headlights and dimmers and speedometer.

Sixteen Valve White Four Engine.

FOLLOWING out the contention of its engineers, The White Company, Cleveland, O., which has religiously adhered to the four-cylinder engine for the

power plant in White cars, has announced a new type that will be used in the 1917 models. It will be shown for the first time at the Automobile Salon in New York. It is a 16-valve, four-cylinder engine of the high speed type and will be installed in a new series of custom designed cars which will sell at prices considerably above those of previous models.

This 16-valve four is introduced by the White engineers as a solution of the multi-cylinder problem and they firmly believe it meets the requirements of a higher standard of engine performance more satisfactorily and efficiently than the multiple cylinder engines.

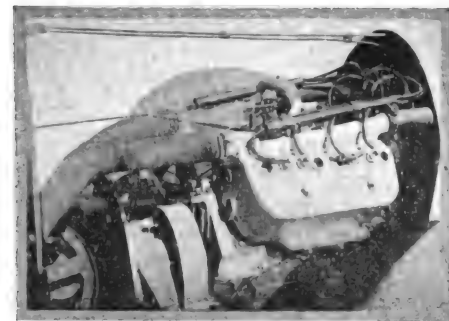
Four-cylinder simplicity and ruggedness is retained in the design and it is claimed that it is capable of any service required by the motorist of today, including high power, speed, rapid get-away and wide flexibility. Also that it will accelerate or slow down and spring into speed again without shifting a gear on steep hills.

Advantages of 16 Valves.

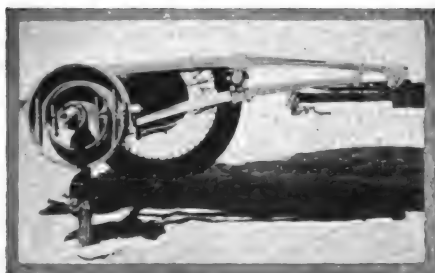
The basis of this contention is that the secret of great flexibility and quick acceleration lies in the use of higher speed engines and consequent lowered geared rear axles and not in increasing the number of cylinders. Through the use of a double set of small valves in each cylinder of the 16-valve four, it is claimed the capacity of the valves is even greater than that of single valves of twice the size. With this adequate valve capacity and light moving parts the higher engine speeds are obtained together with a correct running balance.

The extra valves also result in a more complete scavenging of the cylinders on the exhaust stroke with a resultant intake of more gas. The warping and noise accompanying the action of large valves is also largely eliminated by the use of smaller ones. It is further said that the carbon evil is also practically done away with owing to the complete combustion and exhaustion obtained.

The increase in the number of valves is only one of the important innovations that the White company is presenting in this new design. The engine is built T head shape and for the first time is cast en bloc with removable cylinder heads, the whole mechanism also being embodied in a compact unit power plant. Throughout its entire range of speed, whether running at low or high speed, the engine develops extraordinary power



The Eight-Cylinder Homer Laughlin Engine.



Homer Laughlin Compound Cantilever Spring.

and operates with but slight vibration.

Incident to the announcement of the new motor, the White company announces that in the future it will confine its production to one passenger car chassis of two lengths of wheelbase—137½ inches for the touring cars, limousine and landaulet bodies, and 124½ inches for the coupe, sedan, town cars and run-about bodies.

A new design of chassis frame is also being introduced by the company this year, the frame being arched over the rear axle and curved down in back to meet the ends of long semi-elliptic underslung springs.

The list price on the standard White touring car is \$4600.

Features of the New Airmobile.

THE Rotary Products Company, Los Angeles, Cal., has adapted the rotary principle of generating power from gasoline and storing it as compressed air by driving an air compressor, designed on lines similar to the engine, and in turn piping the air to rotary air motors attached to each of the four wheels. This is probably the most unique idea in motor car propulsion that has been presented this year.

Its practicability rested with the perfection of the rotary principle which involved largely the question of maintaining the necessary pressures in the explosive chambers which heretofore has been impossible because of leakage. The maker of this motor, however, claims that leakage has been negated and that the engine can be run at low speed and produce high pressures, whereas formerly rotary engines were run at high speed and only produced low pressures.

A further and interesting fact about the mechanism is that it is applicable not only as a rotary gasoline engine, but as an efficient air compressor, an air motor or can be adapted as a clutch or brake. The rotary engine is used to drive a rotary air compressor, both machines being hung on cross members in the forward part of the chassis. The air is stored in tanks and piped to the four wheels, which are operated by individual air motors, or as brakes.

By this method of generating and transmitting the power the maker claims to have obtained not only a frictionless drive, but to have eliminated crank and camshafts, flywheel, clutch, transmission, levers and friction brakes; reduced weight and cost of construction and incidentally have adapted a set of air cushions which supplement the springs and reduce the vibration to a minimum.

The New Enger Convertible Twelve.

MOTORISTS inclined to delve into mechanical details when inspecting new models will find something to ponder over in the new Enger convertible twelve engine, which is manufactured by the Enger Motor Car Company, Cincinnati, O. This engine operates

either as a twelve or six-cylinder unit, the change being brought about by a slight movement of a lever.

While one could imagine many complications in such an arrangement, it is in fact a principle of great simplicity and works exceedingly well on the Enger car. It was devised as a means of economy for motorists as only part of the time when a car is running is there any need for the operation of 12 cylinders when a six-cylinder engine would furnish all the power required. There are other times, however, when the extra power to be derived from the 12-cylinder engine comes in handy, if not as a necessity, and for this reason the idea of making a dual service engine out of the 12-cylinder type was hit upon as one that eliminated much waste and economized in car operation in favor of the operator.

The 12-cylinder engine is made by the Enger company and has a bore of 2¾ inches and a stroke of 3½ inches. Its S. A. E. horsepower rating is 27.07. The piston displacement is the smallest of any 12-cylinder motor now made, totaling 186.04 cubic inches. In actual test the motor installed in one of the 1917 model Enger cars was accelerated from stationary to 25 miles an hour in five seconds. The speed range on high gear is from one to 60 miles and when operated on six cylinders the car has been run from 25 to 30 miles on one gallon of gasoline.

The device for changing the motor from a 12 to a six-cylinder power plant is very simple in its operation. A camshaft operated by a lever holds open the exhaust valves of one of the cylinder blocks and simultaneously closes a shutter that prevents the other block of cylinders from receiving gas. It also relieves compression.

The pistons in the block that is cut out continue to reciprocate, but without using any gas or causing any compression. When the engine is making its maximum number of revolutions, 3000 per minute, it develops approximately 50 horsepower.

The Enger touring car model with full equipment, which includes practically all standard conveniences and accessories, is sold for \$1295.

The Ruler Car Has No Frame.

WHILE not in the same category with the other cars described in the foregoing, the Ruler Four, made by the Ruler Motor Car Company, Aurora, Ill., incorporates what is claimed as an absolutely original idea in applying power to automobiles. The Ruler Four is in reality a body with power plant and wheels attached. No frame is used, the bodies being made entirely of steel and being suspended by a patented three-point cradle, having two rear wheels as two points and a ball and socket in the centre of the front cross member of the body as the third point. The clutch transmission and differential are placed in this cradle, giving an absolutely straight line drive.

The maker claims it insures a large proportion of power delivery, as it eliminates the friction which takes place in the universal joints and the tendency to warp out of line as in conventional methods of power plant installation. By unfastening the ball on the forward end of the cradle and disconnecting the rear springs and brakes the body may be removed and another substituted.

As the company makes both a touring car body and roadster on the same principle the power plant may be shifted from one to the other. This shift only requires 20 minutes and the work of two people, according to the maker, and the low cost of the bodies enables the average car owner to have both types.

The engine is a water cooled, four-cylinder, four-cycle type, cast en bloc, with valves in head. It has a 3¼-inch bore and five-inch stroke with a rated horsepower of 16, S. A. E. formula. Two roller bearings and one bronze bearing support the camshaft, which is driven by a silent chain.

A drop forged chrome vanadium steel crankshaft, supported by two annular ball bearings, is used with an offset to prevent excessive side thrust on the cylinder walls. Lubrication is by means of the flywheel rim. The transmission is of the selective sliding type.

Full cantilever springs are used with pressed steel front axle and full floating rear axle. Either wire or disc wheels can be had, they carrying 32x3-inch tires. The wheelbase is 120 inches. The equipment includes clear vision windshield and electric starting and lighting system. The weight of the car is approximately 1000 pounds. The price for either roadster or touring car is \$595.

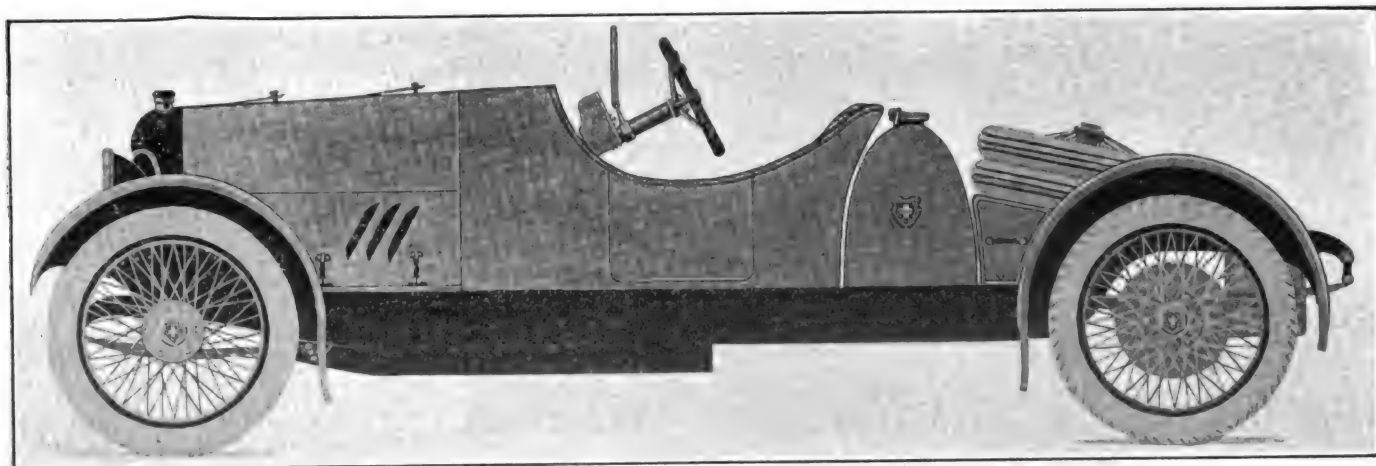
"TAKES A THIEF TO CATCH A THIEF."

If it takes "a thief to catch a thief," as the old axiom states, why not a "thief to prevent a theft." This, at least, is the opinion of the St. Louis police, who recently arrested a notorious leader of a band of automobile thieves, not, however, until after he had plied his criminal pursuits for some time and murdered two members of the force. While in custody he gave the following remedy for the benefit of motorists to prevent thieves from taking their cars:

"Just cross your spark plug wires. Cross two of them and the cylinders won't hit. It will baffle the thief and would take him hours to find out what is wrong, while it would take the owner but two minutes to make his machine safe."

PONTOKLENE CLEANS AND POLISHES AUTOS.

Pontoklene, a new product of the Du Pont Company, Wilmington, Del., has been placed on the market for use in cleaning automobiles and furniture. It will not only remove grease and tar, but also acts as a polisher. It does the work quickly and the polish is obtained with practically no rubbing.



The Geneva Roadster, One of the Season's New and Distinctive Models.

1916 Established a Record for New Cars

Approximately Fifty New Makes of Gasoline Pleasure Cars Were Introduced During the Year, Many of Which Are Already in Production—All Fields Are Invaded by the New Manufacturers

IN THE automobile industry the year 1916 has witnessed a greater growth in production of cars than took place in the entire period covered by the preceding five years. Since last February not less than 50 new concerns have taken up the manufacture of pleasure cars. Most of these new models are already on the market and will be seen at the national shows, but quite a number will not appear until spring.

Taken as a whole, no definite tendency is shown by the new models, the newcomers having invaded all the different fields of power, body design and price. Many are in the low priced class, about an equal number in the medium and several in the high priced class. The majority employ gasoline motors, although the year has developed several new electric types, a combination gasoline and electric and one new steamer. All types of gasoline motors are represented, two, four, six, eight and 12 cylinders being used. There also are types of gasoline rotary motors.

An analysis of the 50 odd new cars would confuse rather than help one to determine the tendency being followed in new designs, as the trend of manufacture in these models reveals nothing unusual as to motors, bodies, springs or any of the other essential features.

Most of the new models are described in brief in this article, except those with power plants of a revolutionary type, which are illustrated and described in another story in this issue.

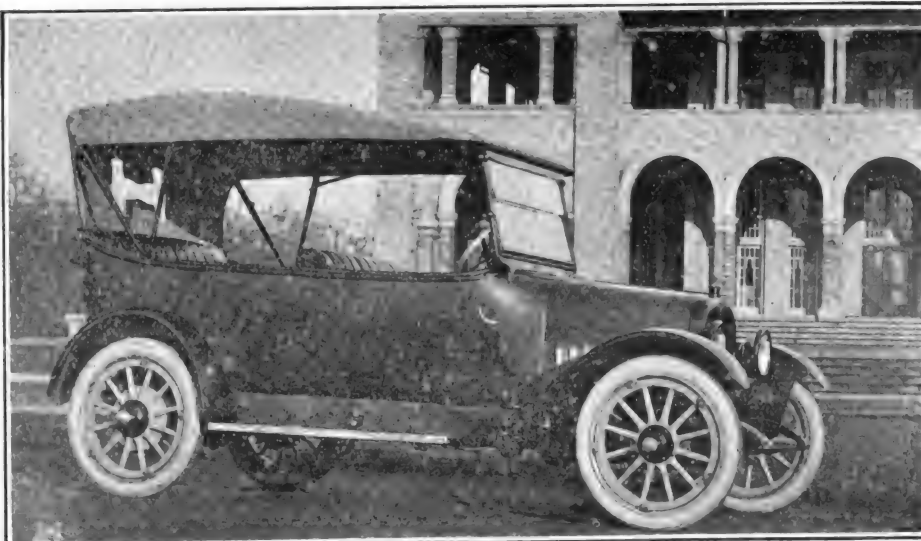
GENEVA.

The Schoeneck Company, Chicago, Ill., in introducing the Geneva car, has added a worthy representative of the highest class of motor car construction. The body design and finish are also in keeping with the distinctiveness of the whole machine.

An extra heavy pressed steel frame with large gusset plates for rigidity forms the chassis with a unit power plant, consisting of a Herschell-Spillman six-cylinder T head motor with four-inch bore and 5½-inch stroke. The cylinders are cast in two blocks of triplets with enclosed valve mechanism. The pistons

have a clearance of only 1½ thousandths of an inch, according to diameters, preventing the oil from passing the rings in sufficient quantities to cause smoking. The power is transmitted through a Brown-Lipe multiple dry disc clutch and a Brown-Lipe selective sliding gear set with four speeds forward and one reverse.

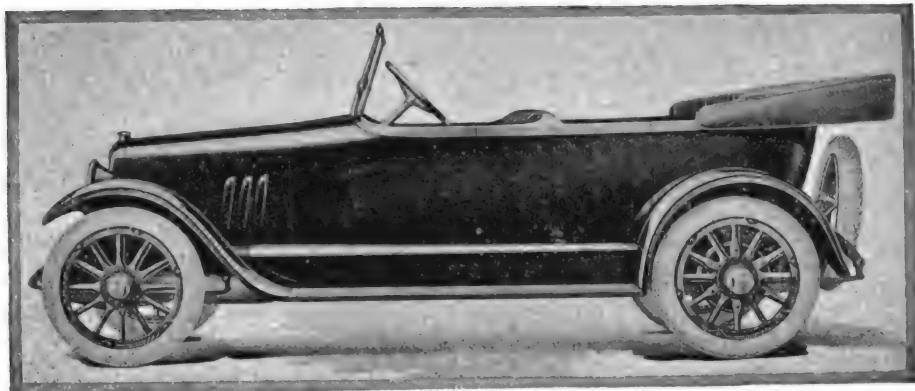
Carburetion is by a Rayfield carburetor fed by a vacuum feed system with a tank located at the rear of the chassis. An Eisemann magneto is used for ignition, and the starting and lighting system is of Westinghouse make, the starting motor being installed in unit with the patented Bendix flywheel shift. The lighting generator is at the forward end of the engine. Cooling is accomplished through a Fedders radiator of cellular type.



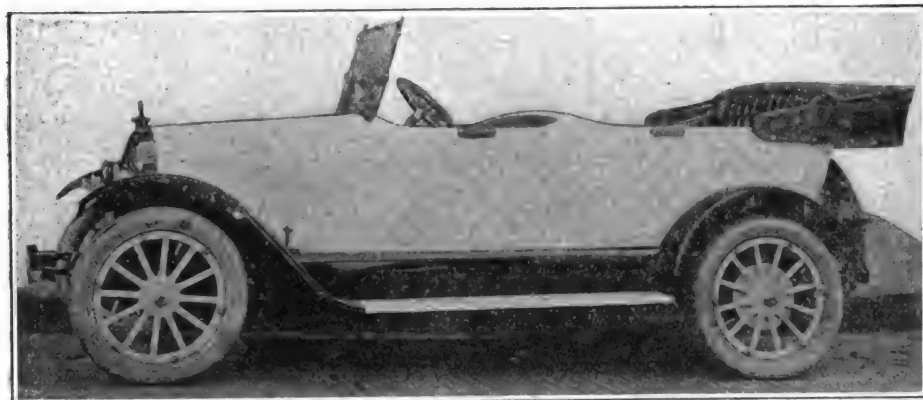
The Harroun Four-Cylinder, Five-Passenger Car.

Timken axles are used on front and rear and are equipped with semi-elliptic springs. The front springs are 36 inches long with two rebound leaves, and the rear are fitted with Hartford shock absorbers. The brakes have 500 inches of braking surface and are 17½ inches in diameter, with a width of 2½ inches. Goodyear Cord tires, 34x4½, are used all around.

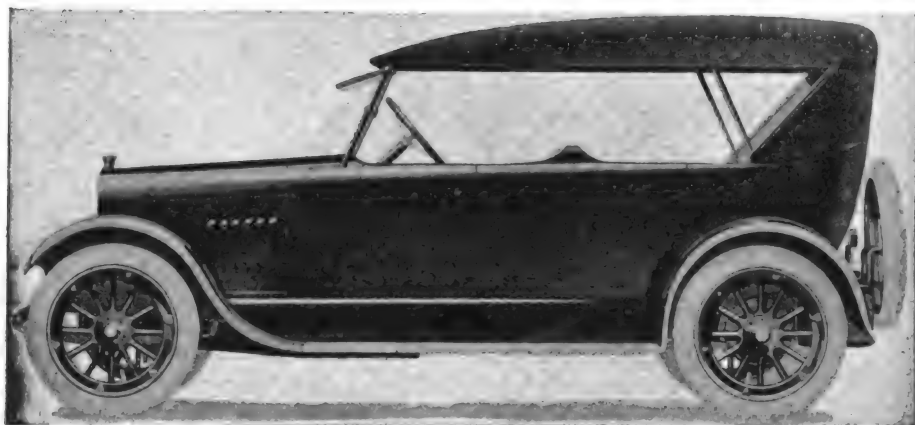
The wheelbase is 139 inches, allowing for the use of commodious bodies, either in the two,



The Bour-Davis Six-Cylinder Touring Car.



The Yale Eight, Finished in Ivory and Black.



The Columbia Six, Five-Passenger Model.



One of the Three Jordan Six Models.

four, six or seven-passenger types. Body colors are optional with the exception of white, for which a small additional charge is made.

Equipment includes one-man top, illuminated instrument board, dash light under bonnet to facilitate inspection of motor at night, speedometer, demountable rims, electric horn under hood, lights in tonneau, cigar lighter, foot and robe rails, tire pump and jack, tools, two thermos bottles conveniently located, Eastman Kodak, Blue Book, "First Aid" kit and spot light attached to windshield.

HARROUN.

The Harroun Motors Corporation, Detroit, Mich., which was formed to produce and market the car designed along original lines by Ray Harroun, the former speedway racer, has a product that is remarkable. It is made up of more pressed steel parts than any other car, and while selling at the low price of \$595 has many features of quality and excellence not to be found in machines selling at a much higher figure.

The body is of the double cowl streamline design and is hung very low, a long cantilever rear spring allowing it to set deeply between the rear wheels. With a wheelbase of 106 inches and a compact condensed power plant, the use of a commodious body is afforded. The rear tonneau measures 49 inches inside the upholstery, making it one of the widest bodies on the market either on a low or high priced car.

A special engine designed by Ray Harroun is used. It has many unusual features. It is of the four-cylinder, valve-in-head type, with the valves mounted on a detachable part of the assembly and actuated by rocker arms from a camshaft in the conventional position. The valves are set at an angle, permitting the spark plugs to enter similarly on the opposite side and in the very centre of the chamber, which is machined to microscopical smoothness.

The engine has a bore of $3\frac{1}{4}$ inches and a stroke of $5\frac{1}{4}$ inches, giving a rated horsepower of 16.9. This extreme type of design was adopted to reduce the weight of the pistons to a minimum and to eliminate unnecessary side friction in the cylinders which ordinarily results from the use of short connecting rods. A device, styled a "stove," is cast integral with the exhaust manifold and air before entering the carburetor passes through the stove and is preheated.

The lubrication system has direct leads to the three main crankshaft bearings, the three camshaft bearings and the four connecting rod bearings. A radiating cooler is employed in the lubricating system, which keeps the oil at an even temperature, increasing the life of its lubricating properties.

A Bosch magneto for ignition and Remy starting and lighting system are standard equipment. The power is transmitted through a pressed steel cone clutch with an asbestos fabric facing and it runs in an oil bath.

A specially designed steering wheel, which absorbs road shocks without af-

fecting the positive use of the wheel for steering, is another unique feature in the car. The rear axle is floating, shafts being removable through the hubs of the wheels.

YALE EIGHT.

The Saginaw Motor Car Company, Saginaw, Mich., is manufacturing the Yale Eight seven-passenger touring car, which is distributed through the E. B. Sutton Sales Company of Saginaw.

In the Yale Eight the designers and engineers have produced a machine that is better than other cars of that type. The body lines have a suggestion of foreign design and the chassis is made up of high class standard parts. There is a Massnick-Phipps V type eight-cylinder engine in the power plant, which is in unit with a Muncie transmission. The engine is $3\frac{1}{2} \times 4\frac{1}{2}$, with a rated horsepower of 31.24.

A Rayfield carburetor and Remy ignition is used and there is a Willard storage battery. Cooling is accomplished by the thermo-syphon system through a radiator of the fin and tube style. There is splash and forced feed lubrication to all bearings.

The springs are 56 inches in length; front, semi-elliptic; rear, three-quarter elliptic, with an angle drop. Timken axles are used in front and rear with heavy artillery type of wheels fitted with demountable rims and 34×4 -inch Goodrich tires, non-skid on rear.

The steering wheel is located on the left hand side and levers in the centre. A pure white finish with black fenders and trimmings is the standard color, but Yale blue with black trimmings is optional.

THE JORDAN.

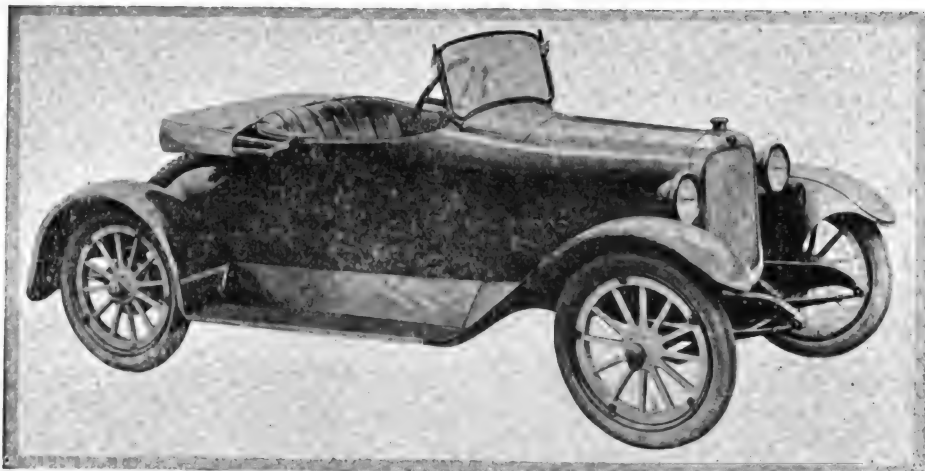
The Jordan Motor Car Company, Cleveland, O., in introducing the Jordan line, which is in the medium price class, has not only expended every effort in producing an ideal chassis, but has designed bodies with many new features.

A standard chassis for all models is used and it is assembled of the products of the best known parts makers in the country. The unit power plant consists of a six-cylinder $3\frac{1}{2} \times 5\frac{1}{2}$ Continental engine, cast en bloc and fitted with a Bosch DU 6 magneto and Bijur two-unit electric starting and lighting system; Brown-Lipe disc clutch in unit with a three-speed gear set; Stromberg carburetor and Stewart vacuum feed system.

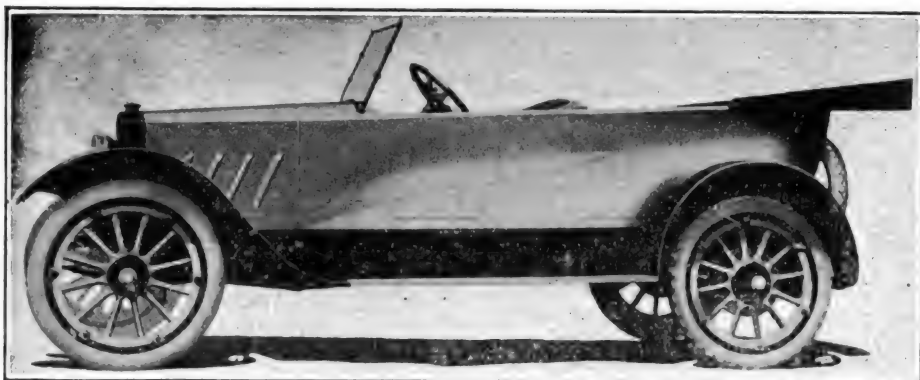
A Willard storage battery, a Fedders radiator and a Gemmer steering post and gear are used. Timken axles are on front and rear and Timken bearings are installed throughout. The wire wheels are fitted with Firestone demountable rims. Semi-elliptic vanadium steel springs are used in front and rear.

Special attention has been devoted to the upholstery, numerous small coiled springs, enclosed in linen bags, being used in the cushions in place of the few large ones that are generally employed.

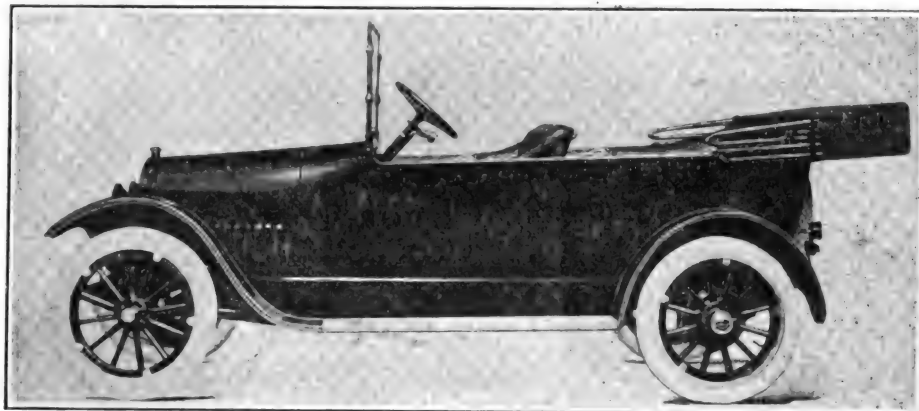
The wheelbase of 127 inches makes very roomy bodies possible and the length also enhances the stream line effect. A tilted, over-lapping rain vision



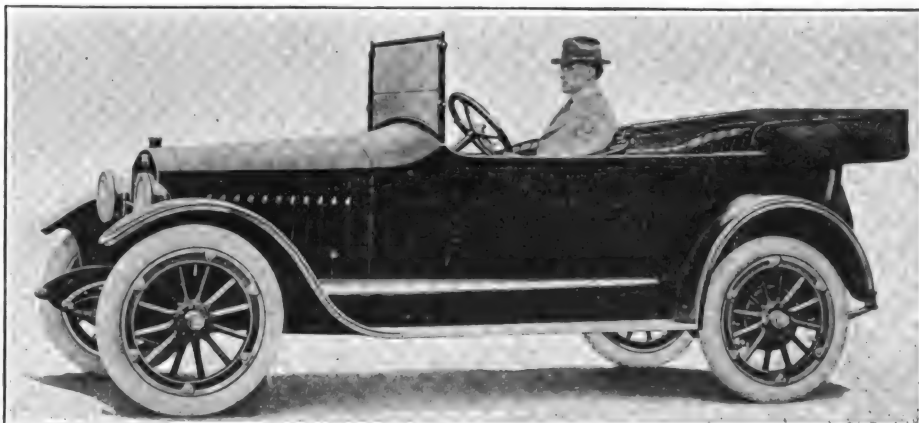
The Malbohm, One of the Season's New Makes.



The Hackett, in Packard Blue and White Wheels.



The Laurel 36 Horsepower Touring Car.



The Liberty Six Has Several Special Features.

windshield gives the car a rakish appearance.

The seven-passenger touring car and the racy roadster models are priced at \$1650 and the four-passenger sport model at \$1750.

BOUR-DAVIS.

The Bour-Davis Company, Detroit, Mich., which was organized in 1915, started production on the Bour-Davis models this fall for the 1917 season. Embodying a full stream line design with double cowl and new type of radiator, which stands on a level with the top lines of the body, gives it a luxurious appearance and marked individuality.

The chassis, which has a wheelbase of 118 inches, is equipped with a Continental-Bour-Davis unit power plant, consisting of a Continental six-cylinder engine, $3\frac{1}{2} \times 4\frac{1}{2}$, cast en bloc, with removable cylinder head, enclosed valves, three-bearing type crankshaft, 2 9/32 inches in diameter. The engine is fitted with a side outlet Stromberg carburetor, a Stewart vacuum tank, a Remy battery ignition system and Ward-Leonard lighting generator. A Bendix gear on the starting motor engages with teeth on the flywheel rim.

Transmission is through a Borg & Beck dry plate clutch in unit with a Detroit Gear Company three-speed gear set, and two-joint propeller shaft driving a three-quarter floating rear axle fitted with spiral bevel gears. The drive is by the Hotchkiss method, through the springs, which are semi-elliptic and self-lubricating. The rear springs are 52x2 inches, with chrome-vanadium main leaves to take the driving strain. Artillery wheels with demountable rims and 32x4-inch tires are used.

The five-passenger touring car sells for \$1250 and the enclosed sedan at \$1250. A choice of color combinations is offered.

THE LIBERTY.

The Liberty Motor Car Company, Detroit, Mich., made its appearance in the motor field with a six-cylinder model selling at \$1095. The chassis has a 115-inch wheelbase on which a five-passenger body of exceptionally fine lines is being installed. The company will also produce a close-coupled, four-passenger open body and a line of closed bodies.

The unit power plant consists of a six-cylinder, L head type, Continental engine, $3\frac{1}{2} \times 4\frac{1}{2}$, with valves enclosed on the right hand side of block and with removable cover plates. A two-unit Delco system is used for starting, lighting and ignition and the carburetion is taken care of by a Rayfield carburetor fed by vacuum system. Transmission is through a three-disc dry plate clutch and a three-speed, selective sliding type of gearset.

A feature in connection with the transmission is the attachment at the rear end of a contracting band brake, which acts upon the propeller shaft and is controlled by the emergency lever. It has a braking surface of 63 inches, operates quickly and effectively as it exerts the increased leverage gained through the

New Makes Not Described Here

FOURS.

BRUNSWICK.

The Brunswick Motor Car Company, Newark, N. J., Model-36, Touring Car, \$1950.

HESELTINE.

Heseltine Corp., New York, N. Y., Model, Touring Car, \$695.

MOORE 30.

Moore Motor Company, Minneapolis, Minn., Model H. G. M., Touring Car, \$550.

O'CONNOR.

O'Connor Corporation, Chicago, Ill., Model-D, Touring Car, \$785.

OLYMPIAN.

Olympian Motors Company, Pontiac, Mich., Model, \$795.

PHIANNA.

Phianna Motors Company, Newark, N. J., Model M, Chassis only, \$3600.

STATES.

States Motor Car Manufacturing Company, Kalamazoo, Mich., Model B, Touring Car, \$845.

TEMLAR.

The Templar Motors Corporation, Cleveland, O., Model 445, Touring Car, \$1250.

GREAT EAGLE.

U. S. Carriage Company, Columbus, O.

WOODS DUAL POWER.

Woods Motor Vehicle Company, 25th street, Chicago, Ill., Model 44, Coupe, \$2650.

EIGHTS.

HOMER-LAUGHLIN.

Homer-Laughlin Engineering Company, Los Angeles, Cal., Model D, Roadster, \$1050.

PILGRIM.

Pilgrim Motors Company, Boston, Mass.

SIXES.

AMERICAN SIX.

American Motor Corporation, Plainfield, N. J., Model A, Touring Car, \$1285.

HOWARD.

The A. Howard Company, Gallon, O.

JONES.

Jones Motor Car Company, Wichita, Kan., Model 26B, Touring Car, \$1475.

OGREN.

Ogren Motor Works, Chicago, Ill.

CHICAGO.

Pan-American Motors Corporation, Chicago, Ill., Model 6-40, Touring Car, \$1250.

S. S. E.

S. S. E. Company, Philadelphia, Penn., Model A-1, Touring Car, Five-Passenger, \$6700.

FIFES.

EAGLE ROTARY.

Eagle Macomber Motor Car Company, Sandusky, O., Model A, Roadster, \$700.

reduction in the rear axle gear ratio.

Both front and rear axles are Timken products, the rear being of the semi-floating type. The propeller shaft has a universal joint on each end and the drive is through a two-pinion type of differential and the rear springs. Both front and rear springs are of the semi-elliptic type, the rear set being underslung.

The cars are equipped with practically all the modern accessory devices that have become standard equipment on the majority of cars. Prices are as follows: Five-passenger touring car, \$1095; five-passenger town car, \$2350; five-passenger touring sedan, \$1295; four-passenger roadster, \$1095.

COLUMBIA SIX.

The Columbia Motors Company, Detroit, Mich., manufactures the Columbia, five-passenger, six-cylinder touring car, which sells for \$1100.

The chassis has a 115-inch wheelbase and is fitted with a unit power plant, consisting of a Continental $3\frac{1}{2} \times 4\frac{1}{2}$ engine, rated at 25 horsepower, a Borg & Beck multiple disc clutch and a Warner three-speed, selective type transmission. The engine is equipped with a Stromberg carburetor, Atwater Kent ignition system and Ward-Leonard two-unit starting and lighting equipment. Timken axles are used in front and rear with Detroit self-lubricating springs, cantilever type, 49 inches long in the rear. The steering gear is the Warner irreversible and adjustable make.

Wheels are of the artillery type, with 34x4-inch tires. Bodies are of full streamline design with double cowl.

THE LAUREL.

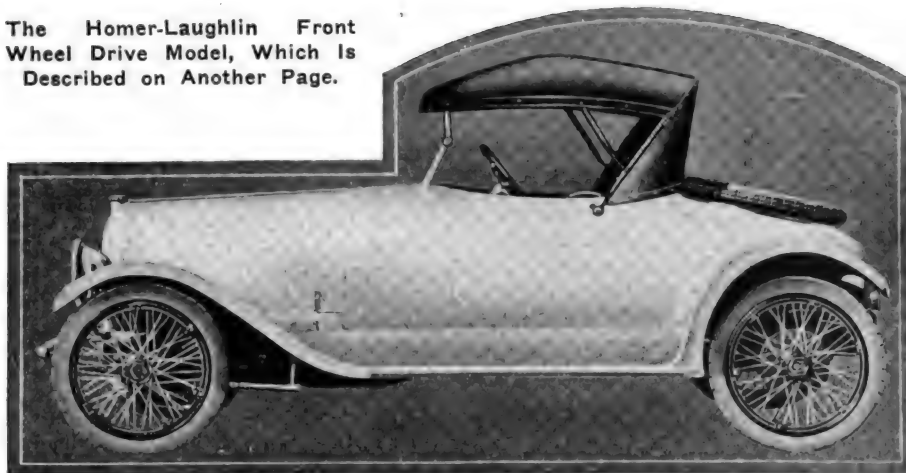
The Laurel Motor Car Company, Richmond, Ind., has added an interesting model to the class of four-cylinder cars. Its make is styled the Laurel "35." It has a 112-inch wheelbase, full stream line body and the engine at 2800 revolutions per minute develops 36 horsepower. The touring car sells for \$795.

The four-cylinder engine is cast en bloc with $3\frac{1}{2}$ -inch bore and $4\frac{1}{2}$ -inch stroke, and detachable cylinder head. The valves are extra large, having a clear opening of 1 1/8 inches and diameter of 1 13/16 inches. They are adjustable and enclosed with breather openings, which allow crank case compression to pass into the valve chamber and through these breathers into the cover.

A Dixie high-tension magneto is used for ignition and a Disco unit with 12-volt storage battery for starting and lighting. Force feed and splash system of lubrication is employed and cooling is accomplished by the thermo-syphon system. The radiator has a flat and cellular appearance.

Power is transmitted through a single steel dry plate clutch with two asbestos wire woven friction discs and a three-speed selective type of gear set. The drive is taken by the Hotchkiss system with two universal joints and spring suspended torque truss. The rear springs are full cantilever, with the main mem-

The Homer-Laughlin Front Wheel Drive Model, Which Is Described on Another Page.



bers of vanadium steel. The rear axle is of the full floating type, locked in the wheel hubs with a six-dog clutch.

THE HACKETT.

The Hackett Motor Car Company, Jackson, Mich., has entered the market with a four-cylinder, five-passenger touring car selling at \$888, and will later produce a cabriolet model at about \$1000 and a three-passenger roadster to sell at \$888, and \$990 with a winter top.

All models will be on the same chassis, which has a Golden, Belknap & Swartz, L head, high speed engine, cast en bloc with $3\frac{1}{4}$ -inch bore and $4\frac{1}{4}$ -inch stroke. The S. A. E. rating of the engine is 22.5; the maximum horse power at 2000 revolutions per minute is 36.9. The cylinder head is detachable and the crank case is in two parts. A combination of force feed and splash systems of lubrication is employed.

The engine is equipped with a Just-rite carburetor fed by a vacuum system. Ignition is by a Remy coil and distributor driven by the camshaft and the lighting and starting system is of the Disco two-unit type. Cooling is by the thermo-siphon principle and a cellular radiator.

Power transmission is through a Golden, Belknap & Swartz single steel disc clutch with rings of wire-wound asbestos fabric, running in oil; a Grant-Lees three-speed, sliding gear set and Walker-Weiss semi-floating type of rear axle. The front springs are semi-elliptic and the rear three-quarter elliptic. The wheelbase is 112 inches and the wheels are equipped with demountable rims and $32 \times 3\frac{1}{2}$ -inch Ajax tires.

The body finish is Packard blue and the wheels are finished in ivory white. French pleated upholstery and heavy metal trimmings in nickel finish give the car a luxurious and distinctive appearance.

MAIBOHM.

The Maibohm Motors Company, Racine, Wis., is manufacturing a new semi-racing type of sport car called the Maibohm roadster, which sells for \$695. It has many distinctive features, including full stream lines, low hanging body, deep seats and has a four-cylinder engine. The one-piece storm-tilt windshield and low top give the car a very "classy"

appearance. The comfort of the occupants has not only been given careful attention, but the color finish is also optional with the purchaser.

A Maibohm engine, $3\frac{1}{4} \times 4$ inches, of L head design, with the block and upper part of the crank case cast as a unit, forms the power plant. The engine is equipped with a Zenith carburetor, thermo-siphon cooling system, Atwater Kent ignition and a 12-volt Disco starting and lighting system. Transmission of power is through a nine-inch dry plate, three disc clutch, enclosed as a unit with a three-speed gear set. The entire power plant is in compact form and suspended at three points.

The Hotchkiss system of drive through the rear springs is employed and the master leaf in the springs is specially treated to take care of the torque. The wheelbase is 105 inches and $30 \times 3\frac{1}{2}$ inch tires are used. Either wood or wire wheels are furnished.

THE GHENT.

The Ghent Motor Company, Chicago, Ill., which has a factory at Ottawa, Ill., has put upon the market two models, one known as the Ghent Four-30 and

the other as the Ghent Eight-40, having four and eight-cylinder engines respectively.

The chassis of the smaller model has a 120-inch wheelbase, with a four-cylinder, $3\frac{1}{4} \times 4\frac{1}{4}$ engine, cast en bloc, L head design. It has a combination force feed and splash oiling system and thermo-siphon cooling. The Schebler model R 1 carburetor with hot air stove and control and Gray & Davis three-unit system for starting, lighting and ignition are standard equipment on the power plant.

Power transmission is through a self-adjusting single steel drive plate clutch with two asbestos woven friction discs, running in a bath of oil, and a three-speed selective type of gear set. The full Hotchkiss system of drive is used, the torque being taken by the rear springs. The rear axle is of the floating type with semi-elliptic springs front and rear. Parker hydraulic pressed steel wheels of the artillery type are used with demountable clincher rims and 31×4 tires.

The drive is on the left hand side and control in the centre. Body design is of straight stream line type with double cowl. The usual equipment is included at the price of \$750.

In the eight-cylinder Ghent, the same wheelbase, wheels, body design, radiator, method of drive and position of control are used as in the "Four-30," but the power plant is a V type T head, eight-cylinder engine with valves of more than half the cylinder diameter. The lubrication system includes the use of a tank placed in the V alley of the motor. It is kept full by a pump and feeds oil through holes directly to the paths followed by the cranks.

The conventional method of casting the water jackets integral with the cylinders has been discarded and overlapping sheet metal plates are used on the outside walls for the cooling water. The water after passing over the heated surfaces passes around the inlet manifold, pre-heating the gas charge before



The Doble Steam Car with Abner Doble at the Wheel.

it enters the cylinders. The transmission and clutch, which are housed in unit with the engine in a standard S. A. E. bell housing, consist of a multiple disc clutch, and three-speed, selective sliding gear set. Semi-elliptic springs are used in front and rear.

In addition to the standard equipment a searchlight of adjustable beam construction, fastened to the windshield, and a combination tail light, an automatic warning signal and a license plate illuminator are furnished. When the foot brake is applied it automatically operates the signal.

Five wire wheels of Zarth construction instead of the pressed steel wheels will be furnished at an additional charge of \$50. The price of the Ghent-Eight-40 is \$1050.

NAPOLEON.

The Napoleon Auto Manufacturing Company, Napoleon, O., has placed on the market two models of Napoleon touring cars. One is a seven-passenger and the other a five-passenger car, both on the same chassis, with a 30 horsepower engine. The power plant includes a four-cylinder, water cooled engine of the L head type with enclosed valves.

A Dyneto two-unit system is used for starting and lighting and a Carter carburetor, with dash control and hot air tube, is supplied with fuel by a Stewart vacuum system. The thermo-syphon system of cooling is employed in connection with a cellular type of radiator. Transmission is through a multiple disc clutch and selective sliding type of gear set, giving three speeds forward and reverse. The drive is on the left hand side and control in the centre.

Equipment includes electric horn, electric head and tail lamps, rear tire carriers, one man top, clear vision windshield and quick action folding side curtains. The wheelbase is 110 inches and weight 2200 pounds. The price is \$795.

BEN-HUR.

The Ben-Hur Motor Company, Cleveland, O., entered the field of high class cars with an assembled machine which has a number of special features. The Ben-Hur is made with four different body types: Seven-passenger and four-passenger touring, cloverleaf roadster and touring sedan. The chassis, which is the same on all models, has a wheelbase of 126 inches. A Ben-Hur-Buda, six-cylinder, 60 horse power engine with splash and forced feed oiling system, constitutes the power plant. It is equipped with Bosch high-tension magneto, Westinghouse separate motor for starting and Westinghouse separate generator for lighting. Transmission is through a disc clutch and selective sliding gear set with three speeds forward and reverse. A 19-gallon gasoline tank is mounted on rear with a two-gallon reserve tank. Timken axles are used in front and rear with wire wheels, on which 35x4½ tires are mounted.

EMERSON.

The Emerson Motors Company, Inc., New York City, in announcing the new

Emerson Four at \$395, created quite a furore in automobile circles, as the price was comparatively low for cars in its class. The five-passenger model touring car will be exhibited at the New York and Chicago automobile shows.

The body design is of the full stream line, double cowl type, with crowned fenders, and is fitted with a sloping two-piece clear vision windshield. The chassis has a pressed steel frame and 110-inch wheelbase. The unit power plant has a 3¼x4-inch cast en bloc engine, multiple disc clutch and three-speed selective type transmission. Ignition is by a distributor in connection with battery, Atwater Kent system. A float feed carburetor is used.

The front axle is a drop forged I beam section and the rear axle is of the full floating type. The wheels are of artillery style fitted with 30x3-inch tires in front and 30x3½ rear. Semi-elliptic springs are used in front and rear. A rack and pinion steering gear is employed, set on the left hand side of the car.

Equipment includes two head and one tail lamps, electric horn, one man top, tool kit, tire repair kit and pump. The cars are all finished in black with nickel trimmings.

THE DREXEL.

The Drexel Motor Car Corporation, Chicago, Ill., has introduced two models in the pleasure car field, a five-passenger touring car and two-passenger roadster, both selling at \$855.

The chassis has a 112-inch wheelbase and is fitted with a unit power plant consisting of a four-cylinder, 3¼x5 engine, cast en bloc, with valves in the head. The cylinder heads are removable. The engine is equipped with a Schebler carburetor, gravity fed, Bosch magneto and Bijur six-volt, two-unit starting and lighting system. Transmission is by multiple disc clutch and three-speed, selective type gear set. The rear axle is full floating and there are three-quarter elliptic springs. Wheels are of the artillery type fitted with Goodyear clincher demountable rims and 33x4 tires.

THE ERIE.

The Erie Motor Car Company, Painesville, O., is manufacturing two models of the Erie car, a five-passenger touring car and two-passenger roadster, both on the same chassis and listed at \$795.

The power plant is a unit of a Golden, Belknap & Swartz, four-cylinder, 3¼x4¼, cast en bloc engine, with removable heads and valves in the side. It is fitted with a Stromberg carburetor, gravity feed, Dixie magneto for ignition, Dyneto six-volt and two-unit starting and lighting system. The thermo-syphon system of cooling through a vertical radiator is used.

Power is transmitted through a multiple disc clutch with a three-speed, Grant-Lees transmission. Three-quarter floating rear axles are used, equipped with three-quarter elliptic springs. The chassis has a wheel base of 112 inches, with artillery type wooden wheels, fitted with

Stanweld quick detachable, demountable rims and 33x4-inch tires.

THE CHARTER OAK.

The Eastern Motors Syndicate, Hartford, Conn., has started work on a plant to produce the Charter Oak car, which will be made in two body styles, a touring car and roadster, with a minimum price set at \$3500.

It is expected that production will commence about April 1, as the manufacturers of the various parts that will enter into its construction are now shipping to the factory. No details have been given out as yet as to the parts to be used, but the car has already been nicknamed "The Specialist's Car," as the parts manufacturers whose products will be used in the assembly, are all leaders in their respective lines.

THE KENT.

The Kent Motors Corporation Newark, N. J., is producing the Kent car in two models, a five-passenger touring and four-passenger club roadster, which sell at \$985. It is an assembled car with a four-cylinder, L head, Continental engine, Timken axles, Bosch ignition, starting and lighting system, Stewart vacuum system and Zenith carburetor. Power transmission is through a disc clutch and selective sliding gear set.

The front springs are semi-elliptic, two inches wide and 36 inches long, and the rear springs are three-quarter elliptic, two inches wide and 50 inches long, with six leaves.

THE PENNSY.

The Pennsy Motors Company, Pittsburgh, Penn., has entered the motor car field with two models, a five-passenger touring car and friendly four-passenger roadster which sell at \$855.

Chassis specifications are the same on both models, with a unit power plant, including a four-cylinder Lycoming engine, 30-35 horsepower, three-speed transmission and multiple disc clutch. Connecticut ignition system is used and the lighting and starting is accomplished with a Dyneto two-unit system, the generator charging a Willard battery. Schwartz wheels with 12 spokes and demountable rims equipped with 32x4 tires are standard equipment.

STEPHENS SIX.

The Stephens Motor Branch of the Moline Plow Company, Freeport, Ill., is introducing the Stephens Six for 1917 with two bodies, a five-passenger touring and three-passenger roadster. The same chassis is used in both models and the price for both is \$1150.

The unit power plant has a Continental model 7 W, six-cylinder engine, 3¼x4¼, cylinders cast en bloc; Borg and Beck multiple disc clutch; selective sliding gear transmission with three speeds forward and reverse. Motor equipment includes a Connecticut automatic ignition system, Zenith carburetor with hot air and hot water attachments, and Auto-Lite starting and lighting system. Forced feed lubrication with pressure gauge is used and cooling is by circulating pump of gear type and a new design of honeycomb radiator.

Car Models, Body Styles and Prices for 1917

Directory of American Made Gasoline Pleasure Cars, Alphabetically Arranged According to Manufacturers' Names with Index to the Pages on Which the Features of Their Mechanisms are Presented

A				B			
Abbott Corp., Cleveland, O.				Baker R. & L. Co., Cleveland, O.			
ABBOTT-DETROIT CHASSIS, Pg. 44				OWEN-MAGNETIC CHASSIS, Pg. 47			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
6-44	Touring	6	7 \$1195	O-36-5	Touring	6	4 \$3750
6-44	Roadster	6	4 1250	O-36-4	Touring	6	7 3750
6-44	Motor Coach	6	4 1495	O-36-6	Roadster	6	4 3750
6-44	Sedan	6	5 1795				
Aland Motor Car Co., Detroit, Mich.				Buckeye Mfg. Co., Anderson, Ind.			
ALAND CHASSIS, Pg. 40				LAMBERT CHASSIS, Pg. 42			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
.....	Touring	4	5 \$1500	80	Touring	4	5 \$985
.....	Roadster	4	2 1500	90	Touring	4	5 850
Allen Motor Co., Fostoria, O.				The Brunswick Motor Car Company, Newark, N. J.			
ALLEN CHASSIS, Pg. 40				BRUNSWICK CHASSIS, Pg. 40			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
37	Touring	4	5 \$795	36	Touring	4	5 \$1950
37	Roadster	4	2 795	37	Runabout	4	2 1950
Classic	Touring	4	5 850	40	Convert. Springfield	4	5 2250
Classic	Tourabout roadster	4	4 850	42	Sport	4	4 1950
Classic	Roadster	4	2 850				
Alter Motor Car Co., Grand Haven, Mich.				Buckeye Mfg. Co., Anderson, Ind.			
ALTERCAR CHASSIS, Pg. 40-44				LAMBERT CHASSIS, Pg. 42			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
E-17	Touring	4	5 \$675	80	Touring	4	5 \$985
F-17	Touring	6	5 850	90	Touring	4	5 850
American Motors Corp., Plainfield, N. J.				The Brunswick Motor Car Company, Newark, N. J.			
AMERICAN SIX CHASSIS, Pg. 44				BRUNSWICK CHASSIS, Pg. 40			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
A	Touring	6	5 \$1285	36	Touring	4	5 \$1950
Anderson Motor Co., Rock Hill, S. C.				The Brunswick Motor Car Company, Newark, N. J.			
ANDERSON 6-40 CHASSIS, Pg. 44				BRUNSWICK CHASSIS, Pg. 40			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
200-A	Touring	6	6 \$1250	36	Touring	4	5 \$1950
200-B	Roadster	6	4 1275	37	Runabout	4	2 1950
200-C	Touring	6	5 1250	40	Convert. Springfield	4	5 2250
Apperson Bros. Auto Co., Kokomo, Ind.				Buckeye Mfg. Co., Anderson, Ind.			
APPERSON CHASSIS, Pg. 44-49				LAMBERT CHASSIS, Pg. 42			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
6-17-7	Touring	6	7 \$1750	80	Touring	4	5 \$985
6-17-5	Touring	6	5 1690	90	Touring	4	5 850
6-17-4	Roadster	6	4 1750				
8-17-7	Touring	8	7 2000				
8-17-4	Roadster	8	4 2000				
Arbens Motor Car Co., Chillicothe, O.				Buckeye Mfg. Co., Anderson, Ind.			
ARBENZ CHASSIS, Pg. 40				LAMBERT CHASSIS, Pg. 42			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
25	Touring	4	5 \$675	80	Touring	4	5 \$985
Auburn Automobile Co., Auburn, Ind.				Buckeye Mfg. Co., Anderson, Ind.			
AUBURN CHASSIS, Pg. 40-44				LAMBERT CHASSIS, Pg. 42			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
4-36U	Touring	4	5 \$895	80	Touring	4	5 \$985
4-36M	Roadster	4	2 895	90	Touring	4	5 850
6-39	Touring	6	5 1185				
6-39	Convertible Sedan	6	5 1260				
6-39C	Chummy Roadster	6	4 1185				
6-39C	Chummy Coupe	6	4 1260				
6-39M	Roadster	6	2 1085				
6-44	Touring	6	7 1535				
6-44	Convertible Sedan	6	7 1785				
Austin Automobile Co., 114-118 Division Ave., Grand Rapids, Mich.				Buckeye Mfg. Co., Anderson, Ind.			
AUSTIN HIGH. KING CHASSIS, Pg. 44-50				LAMBERT CHASSIS, Pg. 42			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
36-66	Touring	6	5-6 \$3400	80	Touring	4	5 \$985
36-66	Roadster	6	2-4 3400	90	Touring	4	5 850
48-66	Touring	6	5-6 4200				
48-66	Roadster	6	2-4 4200				
1917	Touring	12	5-6 3750				
1917	Touring	12	7 3750				
1917	Roadster	12	2-4 3750				
1917	Coupe	12	5 4550				
1917	Sedan	12	7 4950				
1917	Limousine	12	7 5250				
B				Buckeye Mfg. Co., Anderson, Ind.			
Baker R. & L. Co., Cleveland, O.				LAMBERT CHASSIS, Pg. 42			
OWEN-MAGNETIC CHASSIS, Pg. 47				LAMBERT CHASSIS, Pg. 42			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
O-36-5	Touring	6	4 \$3750	80	Touring	4	5 \$985
O-36-4	Touring	6	7 3750	90	Touring	4	5 850
O-36-6	Roadster	6	4 3750				

Buick Motor Co., Flint, Mich.				Buick Motor Co., Flint, Mich.			
BUICK CHASSIS, Pg. 40-45				BUICK CHASSIS, Pg. 40-45			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
D-34	Roadster	4	2 \$660	D-34	Roadster	4	2 \$660
D-35	Touring	4	5 675	D-35	Touring	4	5 675
D-45	Touring	6	5 1070	D-45	Touring	6	5 1070
D-44	Roadster	6	2 1040	D-44	Roadster	6	2 1040
D-47	Sedan	6	7 1835	D-47	Sedan	6	7 1835
D-46	Coupe	6	3 1440	D-46	Coupe	6	3 1440
C				Cadillac Motor Car Co., Detroit, Mich.			
Cadillac Motor Car Co., Detroit, Mich.				CADDILLAC CHASSIS, Pg. 49			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
55	Touring	8	7 \$2080	55	Touring	8	7 \$2080
55	Phaeton	8	4 2080	55	Phaeton	8	4 2080
55	Roadster	8	2 2080	55	Roadster	8	2 2080
55	Club Roadster	8	4 2080	55	Club Roadster	8	4 2080
55	Convertible Victoria	8	4 2550	55	Convertible Victoria	8	4 2550
55	Convertible Touring	8	7 2675	55	Convertible Touring	8	7 2675
55	Coupe	8	4 2800	55	Coupe	8	4 2800
55	Brougham	8	5 2950	55	Brougham	8	5 2950
55	Limousine	8	7 3600	55	Limousine	8	7 3600
55	Imperial	8	7 3750	55	Imperial	8	7 3750
55	Landulet	7	3750	55	Landulet	7	3750
Cameron Motor Co., Norwalk, Conn.				Cameron Motor Co., Norwalk, Conn.			
CAMERON CHASSIS, Pg. 45				CAMERON CHASSIS, Pg. 45			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
1917	Touring	6	5 \$1250	1917	Touring	6	5 \$1250
1917	Roadster	6	2 1250	1917	Roadster	6	2 1250
Carter Mfg. Co., Detroit, Mich.				Carter Mfg. Co., Detroit, Mich.			
BROWNIE CHASSIS, Pg. 40				BROWNIE CHASSIS, Pg. 40			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
49	Touring	4	5 \$625	49	Touring	4	5 \$625
J. I. Case T. M. Co., Racine, Wis.				J. I. Case T. M. Co., Racine, Wis.			
CASE CHASSIS, Pg. 40				CASE CHASSIS, Pg. 40			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
T	Touring	4	7 \$1190	T	Touring	4	7 \$1190
T	Roadster	4	4 1190	T	Roadster	4	4 1190
Chalmers Motor Co., Detroit, Mich.				Chalmers Motor Co., Detroit, Mich.			
CHALMERS CHASSIS, Pg. 45				CHALMERS CHASSIS, Pg. 45			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
6-30	Touring	6	5 \$1090	6-30	Touring	6	5 \$1090
6-30	Touring	6	7 1250	6-30	Touring	6	7 1250
6-30	Sedan	6	6 1850	6-30	Sedan	6	6 1850
6-30	Town Car	6	7 2550	6-30	Town Car	6	7 2550
6-30	Limousine	6	7 2550	6-30	Limousine	6	7 2550
6-30	Roadster	6	2 1070	6-30	Roadster	6	2 1070
6-30	Cabriolet	6	3 1440	6-30	Cabriolet	6	3 1440
Chandler Motor Car Co., Cleveland, O.				Chandler Motor Car Co., Cleveland, O.			
CHANDLER CHASSIS, Pg. 45				CHANDLER CHASSIS, Pg. 45			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
17	Touring	6	7 \$1395	17	Touring	6	7 \$1395
17	Roadster	6	4 1395	17	Roadster	6	4 1395
17	Limousine	6	7 2695	17	Limousine	6	7 2695
17	Coupe	6	4 1995	17	Coupe	6	4 1995
17	Convertible sedan	6	7 1995	17	Convertible sedan	6	7 1995
Chevrolet Motor Co., Flint, Mich.				Chevrolet Motor Co., Flint, Mich.			
CHEVROLET CHASSIS, Pg. 40-49				CHEVROLET CHASSIS, Pg. 40-49			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
490	Roadster	4	2 \$490	490	Roadster	4	2 \$490
490	Touring	4	5 490	490	Touring	4	5 490
F-2	Roadster	4	2 800	F-2	Roadster	4	2 800
F-5	Touring	4	5 800	F-5	Touring	4	5 800
D-2	Roadster	8	2 1100	D-2	Roadster	8	2 1100
D-5	Touring	8	5 1100	D-5	Touring	8	5 1100
Classic Motor Co., Chicago, Ill.				Classic Motor Co., Chicago, Ill.			
CLASSIC CHASSIS, Pg. 40				CLASSIC CHASSIS, Pg. 40			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
100	Touring	4	5 \$885	100	Touring	4	5 \$885
80	Shamrock roadster	4	4 885	80	Shamrock roadster	4	4 885
Cole Motor Car Co., Indianapolis, Ind.				Cole Motor Car Co., Indianapolis, Ind.			
COLE EIGHT CHASSIS, Pg. 49				COLE EIGHT CHASSIS, Pg. 49			
Model	Body	Cyl.	Pas. Price	Model	Body	Cyl.	Pas. Price
860	Touring	8	7 \$1695	860	Touring	8	7 \$1695
861	Roadster	8	3 1695	861	Roadster	8	3 1695
865	Tourberline	8	7	865	Tourberline	8	7
863	Tourcoupe	8	4 2295	863	Tourcoupe	8	4 2295
862	Toursedan	8	7 2295	862	Toursedan	8	7 2295

Columbia Motors Co., Detroit, Mich.

COLUMBIA	CHASSIS, Pg. 45
Model Body	Cyl. Pas. Price
Six Touring	6 5

Commonwealth Motors Co., Chicago, Ill.

PARTIN-PALMER	CHASSIS, Pg. 43
Model Body	Cyl. Pas. Price
20 Runabout	4 2 \$495
32 Touring	4 5 695

Cortland Cart & Carriage Company, Sidney, N. Y.

HATFIELD	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
A Touring	4 5 \$950
H Roadster	4 2 875
I Suburban	4 5 800

Crow Motor Car Co., Elkhart, Ind.

CROW-ELKHART	CHASSIS, Pg. 40
Model Body	Cyl. Pas. Price
35 Touring	4 5 \$795
35 Convertible sedan	4 2 940
33 Cloverleaf	4 2 825

Crowther Motors Corp., Rochester, N. Y.

CROWTHER-DURYEA	CHASSIS, Pg. 40
Model Body	Cyl. Pas. Price
.. Touring	4 5 \$650
.. Runabout	4 2 450

J. Cunningham Son & Co., Rochester, N. Y.

CUNNINGHAM	CHASSIS, Pg. 49
Model Body	Cyl. Pas. Price
V Limousine	8 7 \$5000
V Touring	8 7 3750
V Runabout	8 2 3750

Daniels Motor Car Co., Reading, Penn.

DANIELS	CHASSIS, Pg. 49
Model Body	Cyl. Pas. Price
A Touring	8 7 \$2800
A Landaulet	8 7 4200
A Limousine	8 7 4200
A Roadster	8 2-3-4 2650
A Sedan	8 5 4200
A Cloverleaf	8 4 2700
A Close coupled	8 4 2800

G. W. Davis Motor Car Co., Richmond, Ind.

DAVIS	CHASSIS, Pg. 45
Model Body	Cyl. Pas. Price
6-H Touring	6 7 \$1195
6-I Roadster	6 5 1195
6-K Sedan	6 7 1795
6-J Touring	6 7 1495

Detroit Motor Car Co., Detroit, Mich.

DETROITER	CHASSIS, Pg. 45
Model Body	Cyl. Pas. Price
Six-45 Touring	6 5 \$1195
Six-45 Roadster	6 3 1195

Dispatch Motor Car Co., Minneapolis, Minn.

DISPATCH	CHASSIS, Pg. 40
Model Body	Cyl. Pas. Price
D Roadster	4 2 \$1135
G Touring	4 7 1210
H Coupe	4 3 1400

Dixie Motor Car Co., Louisville, Ky.

DIXIE FLYER	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
M Touring	4 5 \$840
M Roadster	4 4 840
M Sedan	4 5 1275

Dodge Bros., Detroit, Mich.

DODGE BROS.	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
.. Touring	4 5 \$785
.. Winter touring	4 5 950
.. Roadster	4 2 785
.. Winter roadster	4 2 950
.. Convertible sedan	4 5 1135

Dorris Motor Car Co., St. Louis, Mo.

DORRIS	CHASSIS, Pg. 45
Model Body	Cyl. Pas. Price
IB6 Touring	6 7 \$2475
IB6 Limousine	6 7 3675
IB6 Sedan	6 5 3350
IB6 Coupe	6 4 3250

Dort Motor Car Co., Flint, Mich.

DORT	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
6 Cloverleaf	4 3 \$695
9 Touring	4 5 695
9-S Sedan	4 5 1065
9 Sedanet	4 5 815

Drexel Motor Car Corp., Chicago, Ill.

DREXEL	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
.. Roadster	4 2 \$855
.. Touring	4 5 855

Drummond Motor Co., Omaha, Neb.

DRUMMOND	CHASSIS, Pg. 49
Model Body	Cyl. Pas. Price
17 Touring	8 5 \$1800
17 Cloverleaf	8 4 1600
17 Roadster	8 3 1600

Dunn Motor Works, Ogdensburg, N. Y.

DUNN	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
.. Runabout	4 2 \$295

Eagle Macomber Motor Car Co., Sandusky, O.

EAGLE ROTARY	CHASSIS, Pg. ..
Model Body	Cyl. Pas. Price
A Roadster	5 2 \$700
A Cloverleaf	5 3 700

Elgin Motor Car Corp., Chicago, Ill.

ELGIN	CHASSIS, Pg. 45
Model Body	Cyl. Pas. Price
.. Touring	6 6 \$985
.. Roadster	6 4 985

Elkhart Car. & Motor Car Co., Elkhart, Ind.

ELCAR	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
D Touring	4 5 \$845
E Roadster	4 4 845
F Roadster	4 2 845

The Emerson Motors Co., Inc., New York, N. Y.

EMERSON	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
Four Touring	4 5 \$395

Empire Auto Co., Indianapolis, Ind.

EMPIRE	CHASSIS, Pg. 41-45
Model Body	Cyl. Pas. Price
45 Touring	4 5 \$960
60R Roadster	6 4 1145
70 Touring	6 7
70 Touring	6 5

Enger Motor Car Co., Cincinnati, O.

ENGER	CHASSIS, Pg. 50
Model Body	Cyl. Pas. Price
Twin-6 Touring	12 5 \$1295

The Erie Motor Car Co., Painesville, O.

ERIE	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
33 Touring	4 5 \$795
34 Roadster	4 2 795

F. I. A. T., Poughkeepsie, N. Y.

FIAT	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
55-E17 Touring	4 7 \$5500
55-E17 Limousine	4 7 6500

Ford Motor Co., Detroit, Mich.

FORD	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
T Touring	4 5 \$360
T Runabout	4 2 345
T Coupelet	4 2 505
T Sedan	4 5 645
T Town Car	4 6 595

H. H. Franklin Mfg. Co., Syracuse, N. Y.

FRANKLIN	CHASSIS, Pg. 45
Model Body	Cyl. Pas. Price
Series 9 Touring	6 5 \$1850
Series 9 Runabout	6 2 1800
Series 9 Runabout	6 4 1850
Series 9 Brougham	6 4 2700
Series 9 Sedan	6 5 2750
Series 9 Limousine	6 7 3000
Series 9 Town Car	6 7 3000
Series 9 Cabriolet	6 3 2650
M-8 Touring	6 5 1950
M-8 Roadster	6 3 1900
M-8 Berline	6 7 3100
M-8 Coupe	6 3 2600
M-8 Sedan	6 5 2350
M-8 Brougham	6 5 2800

Ghent Motor Co., Chicago, Ill.

GHENT	CHASSIS, Pg. 41-49
Model Body	Cyl. Pas. Price
4-30 Touring	4 5 \$750
4-30 Roadster	4 3 750
8-40 Touring	8 5 1050
8-40 Roadster	8 3 1050

Grant Motor Car Corp., Cleveland, O.

GRANT	CHASSIS, Pg. 45
Model Body	Cyl. Pas. Price
K Touring	6 5 \$825
K Roadster	6 3 825
K Cabriolet	6 3 1050

K Sedan	6 5 1000
K Coupe	6 3 960

H**Hackett Motor Car Co., Jackson, Mich.**

HACKETT	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
Four Touring	4 5 \$888
Four Roadster	4 2 888

Harroun Motors Corp., Detroit, Mich.

HARROUN	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
.. Touring	4 5 \$595

Harvard-Pioneer Motor Car Co., Troy, N. Y.

HARVARD	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
4-20 Roadster	4 2 \$750

Haynes Automobile Co., Kokomo, Ind.

HAYNES	CHASSIS, Pg. 46-50
Model Body	Cyl. Pas. Price
36 Touring	6 5 \$1485
36 Sedan	6 5 2150
37 Touring	6 7 1525
37R Roadster	6 4 1585
37 Sedan	6 7 2250
40 Touring	12 5 1985
40 Sedan	12 5 2650
41 Touring	12 7 2085
41 Sedan	12 7 2750
41R Roadster	12 4 2085

Heeseltine Corp., New York, N. Y.

HESELTINE	CHASSIS, Pg. 41
Model Body	Cyl. Pas. Price
.. Roadster	4 2 \$695
.. Touring	4 4 695

Homer-Laughlin Engineering Co., Los Angeles, Cal.

HOMER-LAUGHLIN	CHASSIS, Pg. 49
Model Body	Cyl. Pas. Price
D Roadster	8 2 \$1050

The A. Howard Co., Gallon, O.

HOWARD	CHASSIS, Pg. 46
Model Body	Cyl. Pas. Price
1917 Touring	6 5
1917 Close Coupled	6 4
1917 Convertible Sedan	6 5

Hudson Motor Car Co., Detroit, Mich.

HUDSON	CHASSIS, Pg. 46
Model Body	Cyl. Pas. Price
Super-Six Phaeton	6 7 \$1650
Super-Six Roadster	6 2 1650
Super-Six Cabriolet	6 3 1950
Super-Six Touring Sedan	6 7 2175
Super-Six Town Car	6 7 2925
Super-Six Town Car Land	6 7 3025
Super-Six Limousine	6 7 3925
Super-Six Limousine Land	6 7 3025

Hupp Motor Car Corp., Detroit, Mich.

HUPMOBILE	CHASSIS, Pg. 42
Model Body	Cyl. Pas. Price
NU Touring	4 7 \$1340
N Touring	4 5 1185
N Year Round Touring	4 5 1385
NR Roadster	4 2 1185
NR Year Round Coupe	4 2 1370
NQ Sedan	4 5 1735

I**Inter-State Motor Co., Muncie, Ind.**

INTER-STATE	CHASSIS, Pg. 42
Model Body	Cyl. Pas. Price
T Touring	4 5 \$850
TR Roadster	4 2 850
TSS Sedan	4 5 1250
TR4 Roadster	4 4 895
TD Touring	4 5 895

J**Jackson Auto Co., Jackson, Mich.**

JACKSON	CHASSIS, Pg. 49
Model Body	Cyl. Pas. Price
Wolverine 349 Roadster	8 2 \$1295
Wolverine 349 Chum. Road.	8 4 1295
Wolverine 349 Touring	8 5 1295
350 Touring	8 5 1195

Jones Motor Car Co., Wichita, Kan.

JONES	CHASSIS, Pg. 46
Model Body	Cyl. Pas. Price
26B Touring	6 7 \$1475
26C Sedan	6 7 2350
26A Roadster	6 4 1475

Jordan Motor Car Co., Cleveland, O.

JORDAN	CHASSIS, Pg. 46
Model Body	Cyl. Pas. Price
60 Touring	6 7 \$1650
60 Sport Car	6 4 1750
60 Roadster	6 3 1650

K			
Kent Motors Corporation, New York, N. Y.			
KENT	CHASSIS, Pg. 42		
Model	Body	Cyl. Pas. Price	
Four	Club Roadster	4 4	\$985
Four	Touring	4 5	985

King Motor Car Co., Detroit, Mich.

KING			
CHASSIS, Pg. 49			
Model	Body	Cyl. Pas. Price	
EE	Touring	8 7	....
EE	Sedan	8 7	....
EE	Roadster	8 3	....
EE	Foursome	8 4	....

Kissel Motor Car Co., Hartford, Wis.

KISSELKAR			
CHASSIS, Pg. 46			
Model	Body	Cyl. Pas. Price	
100 Point 6	Touring	6 5	\$1195
100 Point 6	All Year Touring	6 7	1285
100 Point 6	Sedan	6 7	1635
100 Point 6	Roadster	6 3	1195
100 Point 6	Roadster	6 4	1285
100 Point 6	Coupe	6 4	1635
100 Point 6	Town Car	6 5	1950
6-42	All Year Touring	6 7	1750
6-42	Sedan	6 7	2100
6-42	Roadster	6 4	1650
6-42	Coupe	6 4	2000

Kline Kar Corp., Richmond, Va.

KLINEKAR			
CHASSIS, Pg. 46			
Model	Body	Cyl. Pas. Price	
6-38	Touring	6 5	\$1195
6-38	Roadster	6 2	1175
6-38	Shamrock Roadster	6 4	1195
6-38	Roadster	6 3	1175

L

Laurel Motor Car Co., Richmond, Ind.

LAUREL			
CHASSIS, Pg. 42			
Model	Body	Cyl. Pas. Price	
35	Cloverleaf	4 4	\$895
35	Touring	4 5	850
35	Touring	4 7	835

Lewis Spring & Axle Co., Chelsea, Mich.

HOLLIER			
CHASSIS, Pg. 46-49			
Model	Body	Cyl. Pas. Price	
186	Touring	6 5	\$895
186	Roadster	6 2	895
178	Touring	6 5	1185
178	Roadster	6 4	1145

The Lexington-Howard Co., Connersville, Ind.

LEXINGTON			
CHASSIS, Pg. 46			
Model	Body	Cyl. Pas. Price	
6-O-17	Touring	6 5	\$1185
6-O-17	Clubster	6 4	1185
6-O-17	Convertible Sedan	6 5	1250
6-O-17	Convertible Coupe	6 4	1350
6-P	Touring	6 7	2875

Liberty Motor Car Co., Detroit, Mich.

LIBERTY			
CHASSIS, Pg. 46			
Model	Body	Cyl. Pas. Price	
10-A	Roadster	6 4	\$1095
10-A	Touring	6 5	1095
10-A	Brougham	6 ..	2350

Locomobile Company of America, Bridgeport, Conn.

LOCOMOBILE			
CHASSIS, Pg. 46			
Model	Body	Cyl. Pas. Price	
M-7-48	Touring	6 6	\$5400
M-7-48	Touring	6 7	5400
M-7-48	Limousine	6 7	6500
M-7-48	Landulet	6 7	6600
M-7-48	Berline	6 7	6800
R-7-38	Touring	6 6	4600
R-7-38	Touring	6 7	4600
R-7-38	Touring	6 4	4750
R-7-38	Limousine	6 7	5600
R-7-38	Landulet	6 7	5700
R-7-38	Berline	6 7	5900

Lozier Motor Co., Detroit, Mich.

LOZIER			
CHASSIS, Pg. 42-46			
Model	Body	Cyl. Pas. Price	
84	Touring	4 7	\$1695
84	Limousine	4 7	3250
84	Cabriolet	4 3	2250
84	Roadster	4 2	1695
82	Touring	6 7	2775
82	Limousine	6 7	4450

H. A. Lozier Co., Cleveland, O.

HAL			
CHASSIS, Pg. 50			
Model	Body	Cyl. Pas. Price	
21 A	Touring	12 7	\$2285
21 A	Roadster	12 3	2385
21 A	Shamrock Roadster	12 4	2385
21 A	Springfield	12 7	3250

21 A	Brougham	12 7	4250
21 A	Limousine	12 7	4250
Laverne Automobile Co., Laverne, Minn.			
LUVERNE CHASSIS, Pg. 46			
Model	Body	Cyl. Pas. Price	
760	Touring	6 7	\$2500
260	Roadster	6 2	2250

M

McFarlan Motor Co., Connersville, Ind.			
McFARLAN CHASSIS, Pg. 46			
Model	Body	Cyl. Pas. Price	
122	Touring Roadster	6 3	\$3400
124	Submarine	6 4	3550
125-P	Pasadena	6 5	3200
126	Touring	6 6	3200
127	Touring	6 7	3200
127	Victoria	6 7	3800
131	Town Car	6 7	4300
133	Coupe	6 4	4300
134	Knickerbocker Cab'let	6 7	5000
135	Sedan	6 5	4450
136	Touring Sedan	6 7	4300
136	Speeding Sedan	6 7	4300
137	Philadelphia Berline	6 7	4600
138	Limousine	6 7	4350
138-D	Town Car-Limousine	6 7	4400
141	Continental Landulet	6 7	4600
91	Country Club Coach	6 10	5000

Macon Automobile Co., Macon, Ga.

MACON			
CHASSIS, Pg. 42			
Model	Body	Cyl. Pas. Price	
A	Touring	4 5	....
A	Roadster	4 2	....

The Madison Motors Co., Anderson, Ind.

MADISON			
CHASSIS, Pg. 46-47			
Model	Body	Cyl. Pas. Price	
Standard	Touring	6 5	\$1050
Standard	Touring	6 7	1150
Dolly Madison	Roadster	6 4	1150
De Luxe	Touring	6 5	1150
De Luxe	Touring	6 7	1250

Malbohm Motors Co., Racine, Wis.

MAIBOHM			
CHASSIS, Pg. 42			
Model	Body	Cyl. Pas. Price	
A	Roadster	4 3	\$695

Maxwell Motor Co., Detroit, Mich.

MAXWELL			
CHASSIS, Pg. 42			
Model	Body	Cyl. Pas. Price	
25	Touring	4 5	\$595
25	Roadster	4 2	580
25	Cabriolet	4 2	865
25	Town Car	4 6	915

Mercer Automobile Co., Trenton, N. J.

MERCER			
CHASSIS, Pg. 42			
Model	Body	Cyl. Pas. Price	
22-73	Touring	4 6	\$3500
22-73	Raceabout	4 2	3250
22-73	Sporting	4 4	3500
22-73	Touring Limousine	4 7	5000
22-73	Runabout	4 2	3400

Mets Co., Waltham, Mass.

METZ			
CHASSIS, Pg. 42			
Model	Body	Cyl. Pas. Price	
25	Touring	4 5	\$545
25	Roadster	4 2	545

Mitchell Motors Co., Inc., Racine, Wis.

MITCHELL			
CHASSIS, Pg. 47			
Model	Body	Cyl. Pas. Price	
C-42	Touring	6 5	\$1425
C-42	Touring	6 7	1460
C-42	Roadster	6 2	1425
C-42	Club Roadster	6 5	1495
D-40	Roadster	6 2	1150
D-40	Touring	6 5	1150

Moline Automobile Co., East Moline, Ill.

MOLINE-KNIGHT			
CHASSIS, Pg. 42			
Model	Body	Cyl. Pas. Price	
G	Touring	4 7	\$1750
G	Roadster	4 4	1750
G	Touring Sedan	4 7	2350
G	Coupe	4 4	2400
C	Touring	4 5	1450
C	Roadster	4 4	1450

Monitor Motor Car Co., Columbus, O.

MONITOR			
CHASSIS, Pg. 42-47			
Model	Body	Cyl. Pas. Price	
M-4	Touring	4 5	\$840
M-4	Roadster	4 3-4	840
N	Touring	6 5	1085
O	Roadster	6 4	1085
O	Roadster	6 3	1085

Monroe Motor Co., Pontiac, Mich.

MONROE			
CHASSIS, Pg. 42			
Model	Body	Cyl. Pas. Price	
M-3	Roadster	4 2	\$565

M-3	Cloverleaf	4 3	635
M-3	Sedan	4 4	965
M-4	Touring	4 5	985
M-5	Cloverleaf	4 4	985

Moon Motor Car Co., St. Louis, Mo.

MOON			
CHASSIS, Pg. 47			
Model	Body	Cyl. Pas. Price	
6-43	Touring	6 5	\$1295
6-43	Cabriolet	6 3	1850
6-43	Roadster	6 3	1295
6-66	Sedan	6 7	2250
6-66	Coupe	6 4	2150
6-66	Touring	6 7	1650
6-66	Roadster	6 4	1650
6-66	Cabriolet	6 4	2150

Moore Motor Co., Minneapolis, Minn.

MOORE 30			
CHASSIS, Pg. 42			
Model	Body	Cyl. Pas. Price	
H. G. M.	Touring	4 5	\$550

Murray Motor Car Co., Pittsburgh, Penn.

MURRAY			
CHASSIS, Pg. 49			
Model	Body	Cyl. Pas. Price	
70 T	Touring	8 7	\$2450
70 T	Roadster	8 2	2450

Mutual Motors Co., Jackson, Mich.

MARION-HANDLEY			
CHASSIS, Pg. 47			
Model	Body	Cyl. Pas. Price	
6-40-A	Touring	6 7	\$1275
6-40-A	Roadster	6 4	1275
6-60-B	Touring	6 7	1575

The Napoleon Auto Mfg. Co., Napoleon, O.

NAPOLEON			
CHASSIS, Pg. 43			
Model	Body	Cyl. Pas. Price	
30	Touring	4 5	\$795

Nash Motors Co., Kenosha, Wis.

JEFFERY			
CHASSIS, Pg. 42-46			
Model	Body	Cyl. Pas. Price	
4	Touring	4 7	\$1095
4	Sedan	4 7	1260
4	Touring Sedan	4 7	1320
6	Touring	6 7	1465
6	Roadster	6 2	1435
6	Sedan	6 7	1620
6	Touring Sedan	6 7	1690

National Motor Car & Vehicle Corporation, Indianapolis, Ind.

NATIONAL			
CHASSIS, Pg. 47-50			
Model	Body	Cyl. Pas. Price	
Highway 6	Roadster	6 4	\$1750
Highway 6	Touring	6 7	1750
Highway 6	Coupe	6 4	2400
Highway 6	Touring Sedan	6 5	2350
Highway 12	Roadster	12 4	2150
Highway 12	Touring	12 7	2150
Highway 12	Coupe	12 4	2800
Highway 12	Touring Sedan	12 5	2750

Nordyke & Marmon Co., Indianapolis, Ind.

MARMON		CHASSIS, Pg. 47	
Model	Body	Cyl.	Pas. Price
34	Touring	6	7
34	Touring	6	5
34	Roadster	6	4
34	Roadster	6	3

Olympian Motors Co., Pontiac, Mich.			
OLYMPIAN		CHASSIS, Pg. 43	
Model	Body	Cyl.	Pas. Price
..	Touring	4	5 \$795
..	Touring	4	4 850
..	Roadster	4	2 795

Packard Motor Car Co., Detroit, Mich.			
PACKARD		CHASSIS, Pg. 50	
Model	Body	Cyl.	Pas. Price
2-35	Touring	12	7 \$3500
2-25	Salon Touring	12	7 3500
2-35	Phaeton	12	5 3500
2-35	Salon Phaeton	12	5 3500
2-35	Imperial Limousine	12	7 5150
2-35	Limousine, cab sides	12	7 5000
2-35	Lim. w/out cab sides	12	7 4950
2-35	Land. with cab sides	12	7 5050
2-35	Lim. w/out cab sides	12	6 4900
2-35	Land. w/out c. sides	12	6 4950
2-35	Brougham	12	4 4950
2-35	Chassis only	12	.. 3000
2-25	Touring	12	7 3050
2-25	Phaeton	12	5 3050
2-25	Salon phaeton	12	5 3050
2-25	Runabout	12	2 3050
2-25	Limousine	12	6 4450
2-25	Landaulet	12	6 4500
2-25	Brougham	12	4 4500
2-25	Coupe	12	? 4150
2-25	Chassis only	12	.. 2650
2-35	Landaulet	12	7 5000
2-25	Runabout	12	4 3050

Packet Motor Car Mfg. Co., Minneapolis, Minn.			
PACKET		CHASSIS, Pg. 43	
Model	Body	Cyl.	Pas. Price
..	Roadster	4	2 \$325

Paige-Detroit Motor Car Co., Detroit, Mich.			
PAIGE		CHASSIS, Pg. 47	
Model	Body	Cyl.	Pas. Price
6-39	Touring	6	5 \$1175
6-51	Touring	6	7 1495
6-51	Roadster	6	4 ..
6-51	Coupe	6	3 2100
6-51	Sedan	6	7 2300
6-51	Town car	6	7 2750
6-51	Limousine	6	7 2750

Pan-American Motors Corp., Chicago, Ill.			
CHICAGO		CHASSIS, Pg. 45	
Model	Body	Cyl.	Pas. Price
6-40	Touring	6	5 \$1250

W. A. Paterson Co., Flint, Mich.			
PATERSON		CHASSIS, Pg. 47	
Model	Body	Cyl.	Pas. Price
6-45	Touring	6	5 \$1095
6-45	Touring	6	7 1120
6-45R	Roadster	6	4 1095

Pathfinder Co., Indianapolis, Ind.			
PATHFINDER		CHASSIS, Pg. 50	
Model	Body	Cyl.	Pas. Price
La Salle	Touring	12	7 \$2750
La Salle	Cloverleaf	12	4 2900

Peerless Motor Car Co., Cleveland, O.			
PEERLESS		CHASSIS, Pg. 49	
Model	Body	Cyl.	Pas. Price
56	Touring	8	7 \$1890
56	Roadster	8	3 1890
56	Roadster	8	4 1890
56	Limousine	8	7 3060
56	Sedan	8	5 2750
56	Coupe	8	4 2700

Penny Motors Co. of Pittsburgh, Penn.			
PENNSY		CHASSIS, Pg. 43	
Model	Body	Cyl.	Pas. Price
R	Touring	4	5 \$855
S	Roadster	4	4 855

Phianna Motors Co., Newark, N. J.			
PHIANNA		CHASSIS, Pg. 42	
Model	Body	Cyl.	Pas. Price
M	Chassis only	4	.. \$3600

Pierce-Arrow Motor Car Corp., Buffalo, N. Y.			
PIERCE-ARROW		CHASSIS, Pg. 47-48	
Model	Body	Cyl.	Pas. Price
38-C-4	Runabout	6	2 \$4600
38-C-4	Runabout	6	3 4600
38-C-4	Coupe	6	2 5630
38-C-4	Coupe	6	3 5630
38-C-4	Touring	6	4 4600
38-C-4	Touring	6	5 4600
38-C-4	Brougham	6	.. 5870
38-C-4	Landaulet	6	.. 5870
38-C-4	Sedan	6	.. 5870

38-C-4	Vestibule Brougham	6	.. 6050
38-C-4	Brougham-Landaulet	6	.. 5870
38-C-4	Vestibule Landaulet	6	.. 6050
38-C-4	Vest. Brough.-Land.	6	.. 6050
38-C-4	French Brougham	6	.. 5870
38-C-4	French Brough.-Land.	6	.. 5870
38-C-4	Town Brougham	6	.. 5870
38-C-4	Town Brough.-Land.	6	.. 5870
38-C-4	Roadster	6	4 4600
38-C-4	Convertible Roadster	6	.. 5630
48-B-4	Runabout	6	2 4900
48-B-4	Runabout	6	3 4900
48-B-4	Coupe	6	2 6060
48-B-4	Coupe	6	3 6060
48-B-4	Touring	6	4 4900
48-B-4	Touring	6	5 4900
48-B-4	Touring	6	7 5000
48-B-4	Brougham	6	.. 6180
48-B-4	Suburban	6	.. 6420
48-B-4	Landau	6	.. 6420
48-B-4	Suburban Landau	6	.. 6420
48-B-4	Vestibule Suburban	6	.. 6660
48-B-4	Vestibule Landau	6	.. 6660
48-B-4	Vestibule Brougham	6	.. 6660
48-B-4	Vest. Suburban Land.	6	.. 6660
48-B-4	Roadster	6	4 5000
48-B-4	Convertible Roadster	6	.. 5000
66-A-4	Runabout	6	4 5900
66-A-4	Runabout	6	3 5900
66-A-4	Coupe	6	2 7060
66-A-4	Coupe	6	3 7060
66-A-4	Touring	6	4 5900
66-A-4	Touring	6	5 5900
66-A-4	Touring	6	7 6000
66-A-4	Brougham	6	.. 7180
66-A-4	Suburban	6	.. 7420
66-A-4	Suburban Landau	6	.. 7420
66-A-4	Vestibule Suburban	6	.. 7660
66-A-4	Vestibule Landau	6	.. 7660
66-A-4	Vestibule Brougham	6	.. 7660
66-A-4	Vest. Suburban-Land.	6	.. 7660
66-A-4	Roadster	6	4 6000
66-A-4	Convertible Roadster	6	.. 7060

Pilgrim Motor Car Co., Detroit, Mich.			
PILGRIM		CHASSIS, Pg. 43	
Model	Body	Cyl.	Pas. Price
..	Touring	4	5 \$735

Pilgrim Motors Co., Boston, Mass.			
PILGRIM		CHASSIS, Pg. 49	
Model	Body	Cyl.	Pas. Price
..	Brougham	8	4 ..

Pilliod Motor Co., Toledo, O.			
PILLIOD		CHASSIS, Pg. 43	
Model	Body	Cyl.	Pas. Price
F	Touring	4	5 \$1485
F	Cloverleaf	4	4 1485
F	Roadster	4	2 1485

Pilot Motor Car Co., Richmond, Ind.			
PILOT		CHASSIS, Pg. 48	
Model	Body	Cyl.	Pas. Price
6-45	Get Chummy Road.	6	4 \$1150
6-45	Double Cowl Touring	6	5 1150

F. R. Porter Co., Port Jefferson, N. Y.			
F. R. P.		CHASSIS, Pg. 41	
Model	Body	Cyl.	Pas. Price
45-A	Raceabout	4	2 \$5000
45-B	Tour. (chassis only)	4	7 7000

Premier Motor Corp., Indianapolis, Ind.			
PREMIER		CHASSIS, Pg. 48	
Model	Body	Cyl.	Pas. Price
6B	Touring	6	7 \$1895
6B	Roadster	6	4 1895
6B	Limousine	6	7 3150
6B	Town Car	6	7 3150
6B	Touring Sedan	6	7 2900

Princess Motor Car Corp., Detroit, Mich.			
PRINCESS		CHASSIS, Pg. 43	
Model	Body	Cyl.	Pas. Price
4-36-F	Touring Car	4	5 \$775
4-36-F	Roadster	4	3 775
4-36-F	Speedster	4	2 775

Pullman Motor Car Co., York, Penn.			
PULLMAN		CHASSIS, Pg. 43	
Model	Body	Cyl.	Pas. Price
424	Touring	4	5 \$825
424	Roadster	4	4 825
424	Roadster	4	2 825

Regal Motor Car Co., Detroit, Mich.			
REGAL		CHASSIS, Pg. 43	
Model	Body	Cyl.	Pas. Price
J	Touring	4	5 \$695

Reo Motor Car Co., Lansing, Mich.			
REO		CHASSIS, Pg. 43-48	
Model	Body	Cyl.	Pas. Price
R	Touring	4	5 \$875
M	Touring	6	7 1250

S	Roadster	4	3 875
N	Roadster	6	4 1250

Ri-Chard Auto Mfg. Co., Cleveland, O.			
RI-CHARD		CHASSIS, Pg. 43	
Model	Body	Cyl.	Pas. Price
1917	Touring	4	9 \$7500
1917	Roadster	4	2 7000

Ross & Young Machine Co., Detroit, Mich.			
ROSS		CHASSIS, Pg. 49	
Model	Body	Cyl.	Pas. Price
C	Touring	8	5 \$1350

Saginaw Motor Car Co., Saginaw, Mich.			
YALE 8		CHASSIS, Pg. 50	
Model	Body	Cyl.	Pas. Price
K	Touring	8	7 \$1350

Saxon Motor Car Corp., Detroit, Mich.			
SAXON		CHASSIS, Pg. 43-48	
Model	Body	Cyl.	Pas. Price
B-5-R	Roadster	4	3 \$495
S-4-T	Touring	6	5 815
S-2-R	Roadster	6	3 815

The Schoenck Co., Chicago, Ill.			
GENEVA		CHASSIS, Pg. 45	
Model	Body	Cyl.	Pas. Price
Speedster	Touring	6	6 \$2500
Speedster	Roadster	6	2 2500

Scripps-Booth Corp., Detroit, Mich.			
SCRIPPS-BOOTH		CHASSIS, Pg. 49	
Model	Body	Cyl.	Pas. Price
D	Roadster	8	2 \$1175

Seneca Motor Car Co., Pontoria, O.			
SENECA		CHASSIS, Pg. 43	
Model	Body	Cyl.	Pas. Price
4-27-A	Touring	4	5 \$695
4-27-B	Roadster (cloverleaf)	4	4 695
4-27-C	Roadster (cloverleaf)	4	3 695

Simplex Auto Co., Inc., New Brunswick, N. J.			
SIMPLEX		CHASSIS, Pg. 48	
Model	Body	Cyl.	Pas. Price
5	Chassis only	6	.. \$6000

Singer Motor Co., Inc., New York City.			
SINGER		CHASSIS, Pg. 48	
Model	Body	Cyl.	Pas. Price
17	Touring	6	7 \$3800
17	Touring	6	4 3800
17	Runabout	6	2 3800
17	Limousine	6	7 4750
17	Landaulet	6	.. 4850

S. S. E. Co., Philadelphia, Penn.			
S. S. E.		CHASSIS, Pg. 48	
Model	Body	Cyl.	Pas. Price
A-1	Touring	6	5 \$6700
A-1	Touring	6	7 7000
A-1	Roadster	6	2 6700
A-1	Runabout	6	2 6700
A-1	Limousine	6	.. 8000
A-1	Berline	6	.. 8000
A-1	Coupe	6	.. 7500
A-1	Sedan	6	.. 7500
A-1	Town Car	6	.. 6700

Standard Steel Car Co., Pittsburg, Penn.			
STANDARD		CHASSIS, Pg. 50	
Model	Body	Cyl.	Pas. Price
E	Roadster	8	4 \$1850
F	Touring	8	7 1900
F	Limousine	8	7 3500
F	Convertible Sedan	8	7 2500

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33	Coupe8	4	2900
32	Landulet8	7	3600
33	Landulet Brougham	8	7	3600

**Stephens Motor Branch Moline Plow Co.,
Moline, Ill.**

Model	Body	CHASSIS, Pg. 48	Cyl.	Pas.	Price
60	Roadster	.....6	3		\$1150
65	Touring	.....6	5		1150

Sterling Auto Mfg. Co., Amston, Conn.

Model	Body	CHASSIS, Pg. 40	Cyl.	Pas.	Price
..	Touring	.....4	5		....
..	Roadster	.....4	2		....

Studebaker Corp., Detroit, Mich.

Model	Body	CHASSIS, Pg. 44-48	Cyl.	Pas.	Price
4-40	Touring	.....4	7		\$940
4-40	Roadster	.....4	2		930
4-40	Landau Roadster	4	3		1150
6-50	Touring	.....6	7		1180
6-50	Roadster	.....6	2		1170
6-50	Limousine	.....6	7		2600
6-50	Coupe	.....6	4		1750
6-50	Landau Roadster	6	3		1350
6-50	Sedan	.....6	7		1700

Stutz Motor Car Co., Indianapolis, Ind.

Model	Body	CHASSIS, Pg. 44	Cyl.	Pas.	Price
Bulldog Special	Roadster	...4	4		\$2550
Bulldog Special	Touring	...4	6		2550
Roadster	Roadster	...4	..		2275

Sun Motor Car Co., Inc., Elkhart, Ind.

Model	Body	CHASSIS, Pg. 48	Cyl.	Pas.	Price
17	Touring	.....6	5		\$1095
17	Touring	.....6	7		1145
17	Roadster	.....6	4		1145
17	Sedan	.....6	5		1295

The Templar Motors Corp., Cleveland, O.

Model	Body	CHASSIS, Pg. 44-48	Cyl.	Pas.	Price
445	Roadster	.....4	2		\$1225
445	Roadster	.....4	4		1250
445	Touring	.....4	5		1250
445	Sedan	.....4	5		1850
645	Roadster	.....6	2		1225
645	Roadster	.....6	4		1250
645	Touring	.....6	5		1250
645	Sedan	.....6	5		1850

Trumbull Motor Car Co., Philadelphia, Penn.

Model	Body	CHASSIS, Pg. 44	Cyl.	Pas.	Price
16-B	Roadster	.....4	2		\$395
16-B	Runabout	.....4	2		395
16-B	Coupe	.....4	2		600

U. S. Carriage Co., Columbus, O.

Model	Body	CHASSIS, Pg. 41-45	Cyl.	Pas.	Price
4-50	Special	.....4	..		....
6-50	Special	.....6	..		....

V
Velle Motors Corp., Moline, Ill.

Model	Body	CHASSIS, Pg. 48	Cyl.	Pas.	Price
28	Touring	.....6	5		\$1135
28	Roadster	.....6	4		1135
28	Roadster	.....6	2		1115
28	Coupe	.....6	4		1750
28	Cabriolet	.....6	3		1485
28	Touring Sedan	.....6	5		1685
28	Town Car	.....6	5		2200
27	Touring	.....6	7		1600

W
Wayne Works, Richmond, Ind.

Model	Body	CHASSIS, Pg. 44	Cyl.	Pas.	Price
4-35	Touring	.....4	5		\$750

The Westcott Motor Car Co., Springfield, O.

Model	Body	CHASSIS, Pg. 48	Cyl.	Pas.	Price
Series 17	Touring	.....6	7		\$1690
Series 17	Touring	.....6	5		1590
Series 17	Cloverleaf	.....6	4		1590
Series 17	Touring Sedan	.....6	7		2190
Series 17	Touring Sedan	.....6	5		2090

The White Motor Co., Cleveland, O.

Model	Body	CHASSIS, Pg. 44	Cyl.	Pas.	Price
16-Valve 4	Touring	.....4	7		\$4600
16-Valve 4	Limousine	.....4	7		....
16-Valve 4	Landulet	.....4	7		....

16-Valve 4	Coupe	.....4	3	....
16-Valve 4	Sedan	.....4	4	....
16-Valve 4	Runabout	.....4	4	....

Willis-Overland Co., Toledo, O.

Model	Body	CHASSIS, Pg. 43-47	Cyl.	Pas.	Price
Country Club	Roadster	.....4	4		\$695
85-4	Touring	.....4	5		795
85-4	Touring Sedan	4	5		1195
85-4	Touring Coupe	4	3		1045
85-6	Touring	.....6	5		925
85-6	Tour. Sedan	6	5		1325
85-6	Tour. Coupe	6	3		1175

Model	Body	CHASSIS, Pg. 44	Cyl.	Pas.	Price
88-4	Touring	.....4	7		1285
88-4	Tour. Sedan	4	7		1950
88-4	Limousine	.....4	7		1950

Willis Six
CHASSIS, Pg. 48

Model	Body	CHASSIS, Pg. 48	Cyl.	Pas.	Price
48	Touring	.....6	7		\$3500
48	Touring	.....6	4		3500

The Winton Co., Cleveland, O.

Model	Body	CHASSIS, Pg. 48	Cyl.	Pas.	Price
48	Touring	.....6	7		\$3500
48	Touring	.....6	4		3500

Electric Pleasure Car Models

Complete Classification of Chassis, Body
Styles and Prices with Index to Specifications.

A
Anderson Electric Car Co., Detroit, Mich.

Model	Type	CHASSIS, Pg. 50	Pas.	Price
63	Brougham	.....4		\$2275
63	Cabriolet	.....3		2175
63	Brougham	.....5		*2350
63	Touring	.....4		1775
63	Roadster	.....5		2375
63	Runabout	.....5		2325
62	Cabriolet	.....3		2175
62	Brougham	.....4		2275
62	Brougham	.....5		2350
62	Touring	.....4		1775
62	Roadster	.....5		2375
62	Runabout	.....5		2325
64	Brougham	.....5		2350
64	Brougham	.....4		2275
64	Cabriolet	.....3		2175
64	Touring	.....4		1775
64	Roadster	.....5		2375
64	Runabout	.....5		2325
68	Touring	.....4		1775
68	Brougham	.....4		2275
68	Brougham	.....5		2350
68	Cabriolet	.....3		2175
68	Roadster	.....5		2375
68	Runabout	.....5		2325

*Price includes battery.

B
Baker R. & L. Co., Cleveland, O.

Model	Type	CHASSIS, Pg. 50	Pas.	Price
..	Brougham BX7	.....4		\$2800
..	Coach J7	.....5		3000

Beardsley Electric Co., Los Angeles, Cal.

Model	Type	CHASSIS, Pg. 50	Pas.	Price
100	Brougham	.....5		\$2650
100	Brougham	.....4		2000
100	Brougham	.....4		1285
100	Roadster	.....3		2250
200	Roadster	.....3		2250
200	Brougham	.....5		2650
200	Brougham	.....4		2000
200	Brougham	.....4		1285
400	Brougham	.....4		2000
400	Brougham	.....5		2650
400	Roadster	.....3		2250
400	Brougham	.....4		1285
500	Brougham	.....4		1285
500	Brougham	.....5		2650
500	Brougham	.....4		2000
500	Roadster	.....2		2250

C
**Columbia Electric Vehicle Company,
Detroit, Mich.**

Model	Type	CHASSIS, Pg. 50	Pas.	Price
..	Runabout	.....2		*\$1175

48	Roadster	.....6	2	3500
48	Roadster	.....6	3	3500
48	% Limousine	.....6	7	4500
48	Coupe	.....6	3	4500
48	Sedan	.....6	6	4750
48	Full 4 Door Lim	6	7	4750
48	Limousine landulet	6	7	4750
48	Touring	.....6	6	3500
48	Touring	.....6	5	3500
48	Touring	.....6	7	2735
33	Touring	.....6	6	2835
33	Touring	.....6	5	2685
33	Touring	.....6	4	2685
33	Roadster	.....6	2	2685
33	Roadster	.....6	3	2685
33	% Limousine	.....6	7	3650
33	Coupe	.....6	3	3600
33	Sedan	.....6	6	3900
33	Full 4 Door Lim	6	7	3900
33	Limousine Landulet	6	7	3900

**Woods Motor Vehicle Co., 25th Street,
Chicago, Ill.**

Model	Body	CHASSIS, Pg. 44	Cyl.	Pas.	Price
44	Coupe	.....4	4		\$2650

..	Brougham	.....4		*1575
..	Cabriolet	.....3		*1375

*Exide battery or U. S. L. battery \$50 extra.

F
The Fritchle Co., Denver, Col.

Model	Type	CHASSIS, Pg. 50	Pas.	Price
..	Colonial Brougham	.....5		\$3600
..	Colonial Coupe	.....4		3200

H
Hupp-Yeats Electric Car Co., Detroit, Mich.

Model	Type	CHASSIS, Pg. 50	Pas.	Price
4	Coupe	.....4		\$1500
5	Coupe	.....4		1750

M
Milburn Wagon Co., Toledo, O.

Model	Type	CHASSIS, Pg. 50	Pas.	Price
22	Brougham	.....4		*\$1685

*Extra charge for Edison batteries

O
The Ohio Electric Car Co., Toledo, O.

Model	Type	CHASSIS, Pg. 50	Pas.	Price
12	Coupe	.....5		*\$2400
*3	Brougham	.....5		*2900
63	Double Drive Brougham	5		*3250

*Battery is included in price.

**This Number
Is Valuable**

**Keep It Handy-- You
Will Often Have
Occasion To Refer
To It, and Duplicate
Copies Are Not Easily
Attained.**

Cars for 1917 and Addresses of the Makers.

Alphabetical Index of Gasoline and Electric Pleasure Car Models
with the Location and Corporate Name of the Manufacturers.

- ABBOTT-DETROIT**, Abbott Corp., Cleveland, O.
AIRMOBILE, Rotary Products Co., Los Angeles, Cal.
ALAND, Aland Motor Car Co., Detroit, Mich.
ALLEN, Allen Motor Co., Fostoria, O.
ALTER, Alter Motor Car Co., Grand Haven, Mich.
AMERICAN, American Motors Corp., Plainfield, N. J.
AMS-STERLING, Sterling Auto Mfg. Co., Amston, Conn.
ANDERSON, Anderson Motor Co., Rock Hill, S. C.
APPERSON, Apperson Bros. Auto Co., Kokomo, Ind.
ARBENZ, Arbenz Motor Car Co., Chillicothe, O.
AUBURN, Auburn Automobile Co., Auburn, Ind.
AUSTIN, Austin Automobile Co., Grand Rapids, Mich.
BAILEY ELECTRIC, S. R. Bailey & Co., Amesbury, Mass.
BAKER R & L, Baker R & L Co., Cleveland, O.
BEARDSLEY ELECTRIC, Beardsley Electric Co., Los Angeles, Cal.
BELL, Bell Motor Car Co., York, Penn.
BEN-HUR, Ben-Hur Motor Co., Willoughby, O.
BIDDLE, Biddle Motor Car Co., Philadelphia, Penn.
BOUR-DAVIS, Bour-Davis Motor Car Co., Detroit, Mich.
BREWSTER, Brewster & Co., Long Island City, N. Y.
BRISCOE, Briscoe Motor Co., Jackson, Mich.
BROWNIE, Carter Mfg. Co., Detroit, Mich.
BRUNSWICK, Brunswick Motor Car Co., Newark, N. J.
BUICK, Buick Motor Co., Flint, Mich.
CADILLAC, Cadillac Motor Car Co., Detroit, Mich.
CAMERON, Cameron Car Co., Norwalk, Conn.
CASE, J. I. Case T. M. Co., Racine, Wis.
CHALMERS, Chalmers Motor Co., Detroit, Mich.
CHANDLER, Chandler Motor Car Co., Cleveland, O.
CHARTER OAK, Eastern Motors Syndicate, Hartford, Conn.
CHEVROLET, Chevrolet Motor Co., Flint, Mich.
CHICAGO, Pan-American Motors Corp., Chicago, Ill.
CLASSIC, Classic Motor Co., Chicago, Ill.
COLE, Cole Motor Car Co., Indianapolis, Ind.
COLUMBIA, Columbia Electric Vehicle Co., Detroit, Mich.
COLUMBIA, Columbia Motors Co., Detroit, Mich.
CRAWFORD, Crawford Automobile Co., Hagerstown, Md.
CROW-ELKHART, Crow Motor Car Co., Elkhart, Ind.
CROWTHER-DURYEA, Crowther Motors Corp., Rochester, N. Y.
CUNNINGHAM, J. Cunningham Son & Co., Rochester, N. Y.
DANIELS, Daniels Motor Car Co., Reading, Penn.
DAVIS, G. W. Davis Motor Car Co., Richmond, Ind.
DETROIT ELECTRIC, Anderson Electric Car Co., Detroit, Mich.
DETROITER, Detrolter Motor Car Co., Detroit, Mich.
DISPATCH, Dispatch Motor Car Co., Minneapolis, Minn.
DIXIE FLYER, Dixie Motor Car Co., Louisville, Ky.
DOBLE, General Engineering Co., Detroit, Mich.
DODGE BROS., Dodge Bros., Detroit, Mich.
DORRIS, Dorris Motor Car Co., St. Louis, Mo.
DORT, Dort Motor Car Co., Flint, Mich.
DREXEL, Drexel Motor Car Corp., Chicago, Ill.
DRUMMOND, Drummond Motor Co., Omaha, Neb.
DUNN, Dunn Motor Works, Ogdensburg, N. Y.
EAGLE-MACOMBER, Eagle-Macomber Motor Car Co., Sandusky, O.
ELCAR, Elkhart Car and Motor Car Co., Elkhart, Ind.
ELGIN, Elgin Motor Car Corp., Chicago, Ill.
EMERSON, Emerson Motors Co., New York, N. Y.
EMPIRE, Empire Auto Co., Indianapolis, Ind.
ENGER, Enger Motor Car Co., Cincinnati, O.
ERIE, Erie Motor Car Co., Painesville, O.
FIAT, F. I. A. T. Co., Poughkeepsie, N. Y.
FORD, Ford Motor Co., Detroit, Mich.
FRANKLIN, H. H. Franklin Mfg. Co., Syracuse, N. Y.
FRITCHLE, Fritchle Electric Co., Denver, Col.
F. R. P., F. R. Porter Co., Port Jefferson, N. Y.
GENEVA, Schoenck Co., Chicago, Ill.
GHEHT, Ghent Motor Co., Chicago, Ill.
GLIDE, Bartholomew Co., Peoria, Ill.
GRANT, Grant Motor Car Corp., Cleveland, O.
GREAT EAGLE, U. S. Carriage Co., Columbus, O.
HACKETT, Hackett Motor Car Co., Detroit, Mich.
HALL, H. A. Lozier Co., Cleveland, O.
HALLADAY, Barley Motor Car Co., Streator, Ill.
HARROUN, Harroun Motors Corp., Detroit, Mich.
HARVARD, Harvard-Pioneer Motor Car Co., Troy, N. Y.
HATFIELD, Cortland Cart & Carriage Co., Sidney, N. Y.
HAYNES, Haynes Automobile Co., Kokomo, Ind.
HESLITINE, Heseltine Corp., New York, N. Y.
HOLLIER, Lewis Spring & Axle Co., Chelsea, Mich.
HOMER-LAUGHLIN, Homer Laughlin Eng. Co., Los Angeles, Cal.
HOWARD, A. Howard Co., Gallon, O.
HUDSON, Hudson Motor Car Co., Detroit, Mich.
HUPMOBILE, Hupp Motor Car Co., Detroit, Mich.
HUPP-YEATS, Hupp-Yeats Electric Car Co., Detroit, Mich.
INTER-STATE, Inter-State Motor Co., Muncie, Ind.
JACKSON, Jackson Automobile Co., Jackson, Mich.
JEFFERY, Nash Motors Co., Kenosha, Wis.
JONES, Jones Motor Car Co., Wichita, Kan.
JORDAN, Jordan Motor Car Co., Cleveland, O.
KENT, Kent Motors Corp., New York, N. Y.
KING, King Motor Car Co., Detroit, Mich.
KISSELKAR, Kissel Motor Car Co., Hartford, Wis.
KLINEKAR, Kline Car Corp., Richmond, Va.
LAMBERT, Buckeye Mfg. Co., Anderson, Ind.
LAUREL, Laurel Motor Car Co., Richmond, Ind.
LAYMAN-LOWY, Layman-Lowy Motor Co., New York, N. Y.
LENOX, Lenox Motor Car Co., Boston, Mass.
LEXINGTON, Lexington-Howard Co., Connersville, Ind.
LIBERTY, Liberty Motor Car Co., Detroit, Mich.
LOCOMOBILE, Locomobile Co. of America, Bridgeport, Conn.
LOZIER, Lozier Motor Co., Detroit, Mich.
LUVERNE, Luverne Automobile Co., Luverne, Minn.
McFARLAN, McFarlan Motor Co., Connersville, Ind.
MACON, Macon Automobile Co., Macon, Ga.
MADISON, Madison Motors Co., Anderson, Ind.
MAIBOHM, Malbohm Motors Co., Racine, Wis.
MARION HANDLEY, Mutual Motors Co., Jackson, Mich.
MARMON, Nordyke & Marmon Co., Indianapolis, Ind.
MAXWELL, Maxwell Motor Co., Detroit, Mich.
MERCER, Mercer Automobile Co., Trenton, N. J.
METZ, Metz Co., Waltham, Mass.
M. H. C., Michigan Hearse & Motor Co., Grand Rapids, Mich.
MILBURN, Milburn Wagon Co., Toledo, O.
MITCHELL, Mitchell Motors Co., Racine, Wis.
MOLINE-KNIGHT, Moline Automobile Co., East Moline, Ill.
MONITOR, Monitor Motor Car Co., Columbus, O.
MONROE, Monroe Motor Co., Pontiac, Mich.
MOON, Moon Motor Car Co., St. Louis, Mo.
MOORE, Moore Motor Co., Minneapolis, Minn.
MURRAY, Murray Motor Car Co., Pittsburgh, Penn.
NAPOLEON, Napoleon Auto Mfg. Co., Napoleon, O.
NATIONAL, National Motor Car and Vehicle Corp., Indianapolis, Ind.
OAKLAND, Oakland Motor Car Co., Pontiac, Mich.
O'CONNOR, O'Connor Corp., Chicago, Ill.
OGREN, Ogren Motor Works, Chicago, Ill.
OHIO ELECTRIC, Ohio Electric Car Co., Toledo, O.
OLDSMOBILE, Olds Motor Works, Lansing, Mich.
OLYMPIAN, Olympian Motors Co., Pontiac, Mich.
OVERLAND, Willys-Overland Co., Toledo, O.
OWEN-MAGNETIC, Baker R. & L. Co., Cleveland, O.
PACKARD, Packard Motor Car Co., Detroit, Mich.
PACKET, Packet Motor Car Mfg. Co., Minneapolis, Minn.
PAIGE, Paige-Detroit Motor Car Co., Detroit, Mich.
PARTIN-PALMER, Commonwealth Motors Co., Chicago, Ill.
PATERSON, W. A. Paterson Co., Flint, Mich.
PATHFINDER, Pathfinder Co., Indianapolis, Ind.
PEERLESS, Peerless Motor Car Co., Cleveland, O.
PENNSY, Pennsy Motors Co. of Pittsburgh, Pittsburgh, Penn.
PHIANNNA, Phianna Motors Co., Newark, N. J.
PIERCE-ARROW, Pierce-Arrow Motor Car Corp., Buffalo, N. Y.
PILGRIM, Pilgrim Motor Car Co., Detroit, Mich.

PILGRIM, Pilgrim Motors Co., Boston, Mass.
PILLIOD, Pilliod Motor Co., Toledo, O.
PILOT, Pilot Motor Car Co., Richmond, Ind.
PREMIER, Premier Motor Corp., Indianapolis, Ind.
PRINCESS, Princess Motor Car Corp., Detroit, Mich.
PULLMAN, Pullman Motor Car Co., York, Penn.
REGAL, Regal Motor Car Co., Detroit, Mich.
REO, Reo Motor Car Co., Lansing, Mich.
RI-CHARD, Ri-Chard Auto Mfg. Co., Cleveland, O.
ROAMER, Barley Motor Car Co., Streator, Ill.
ROSS, Ross & Young Machine Co., Detroit, Mich.
RULER, Ruler Motor Car Co., Aurora, Ill.
SAXON, Saxon Motor Car Corp., Detroit, Mich.

SCRIPPS-BOOTH, Scripps-Booth Corp., Detroit, Mich.
SENECA, Seneca Motor Car Co., Fostoria, O.
SIMPLEX, Simplex Auto Co., New Brunswick, N. J.
SINGER, Singer Motor Co., New York, N. Y.
S. S. E., S. S. E. Co., Philadelphia, Penn.
STANDARD, Standard Steel Car Co., Pittsburgh, Penn.
STANLEY, Stanley Motor Carriage Co., Newton, Mass.
STATES, States Motor Car Mfg. Co., Kalamazoo, Mich.
STEARNS-KNIGHT, F. B. Stearns Co., Cleveland, O.
STEINMETZ ELECTRIC, Dey Electric Corp., New York, N. Y.
STEPHENS, Stephens Motor Branch Moline Plow Co., Moline, Ill.
STUDEBAKER, Studebaker Corp., Detroit, Mich.
STUTZ, Stutz Motor Car Co., Indianapolis, Ind.

SUN, Sun Motor Car Co., Elkhart, Ind.
TEMPLAR, Templar Motors Corp., Cleveland, O.
TRUMBULL, Trumbull Motor Car Co., Philadelphia, Penn.
VELIE, Velie Motors Corp., Moline, Ill.
WAYNE-RICHMOND, Wayne Works, Richmond, Ind.
WESTCOTT, Westcott Motor Car Co., Springfield, O.
WHITE, White Motor Co., Cleveland, O.
WILLYS-KNIGHT, Willys-Overland Co., Toledo, O.
WILLYS-SIX, Willys-Overland Co., Toledo, O.
WINTON, Winton Co., Cleveland, O.
WOODS DUAL POWER, Woods Motor Vehicle Co., Chicago, Ill.
YALE, Saginaw Motor Car Co., Saginaw, Mich.

Meaning of Terms Used in Specifications.

Horsepower (S. A. E.)—Horsepower in each instance is according to the rating of the Society of Automobile Engineers, whose formula has been generally accepted as standard and consists of multiplying the square of the diameter of the cylinder bore in inches by the number of cylinders and dividing by the constant 2.5. The solution of this formula gives the horsepower at 1000 feet per minute piston speed and should not be taken to indicate the maximum power of which an engine may be capable.

Piston Displacement—This designation is intended to express the space through which the pistons sweep in the cylinder during the completion of one of their strokes. This is determined by multiplying the square of the bore in inches by the constant .7854, and this result by the number of cylinders and finally that sum by the length of the stroke in inches.

Cylinders, Shape and Cast—This refers to the number of cylinders, the general contour of the engine and how the cylinders are grouped. The shapes of the engines are expressed as L-head, T-head, I-head and V. In the L-head type the valves are all on one side; in the T-head, the inlet valves are on one side and the exhaust on the other; in the I-head, the valves are in the head, or there may be one set in the head and another on one side. In the V shaped engine, the valves may be in the head or on the sides, either in the V or on the outside, or a combination of these locations. The grouping of the cylinders is expressed either by block (cylinders all integral), separately (each cylinder individual), 2s (in pairs), 3s (in groups of three each), 4s (an eight-cylinder engine in two blocks of four each), 6s (a 12-cylinder engine with two blocks of six cylinders each).

Type Camshaft Drive—Under this head appears spur, helical and chain, the first referring to a plain spur gear driving the camshaft, the second a helically cut gear and the third a silent chain drive.

Cooling System—Thermo-siphon systems, or natural flow methods, require no circulating pump. In the pump system a centrifugal pump generally is used to force the water through the cooling installation.

Lubrication System—Three systems are shown. The splash system consists of distributing the oil in the crank case by means of dips on the connecting rod ends. In the force feed the oil is pumped to the working parts through leads. The force feed and splash is a combination of the two other methods.

Ignition Type—Four systems are mentioned. The single has one source of current and one set of spark plugs. The double includes magneto and battery and two sets of plugs, of which only one set operates while the engine is running. The dual has battery and magneto and one set of plugs. Two-point ignition has

double-distributor magneto and two sets of plugs which operate simultaneously.

Fuel Feed—In the gravity system the gasoline flows naturally from a tank in

What the Abbreviations Indicate.

SHAPE: I, I-head; L, L-head; T, T-head; V, like letter V.

CAST: Block, cylinders integral; Sep., separately; 2s, in pairs; 3s, in threes; 4s, in two blocks of four each; 6s, in two blocks of six each.

MAKE OF MOTOR: Eagle-Mac, Eagle-Macomber; G. B. & S., Golden, Belknap & Schwartz; H.-Laughlin, Homer-Laughlin; H.-Spill, Herschell-Spillman; Mol.-Knight, Moline-Knight; R. & B., Rutenber or Beaver; Woods-Mil., Woods-Milwaukee.

VALVES: Inside, on the inner sides of the V; Outside, on the outer sides of the V; R. & H., right side and head; R. & L., right and left sides; Sleeve, Knight type of engine.

COOLING: Ther.-Syp., thermo-siphon.

LUBRICATION: Force F., force feed; F. F. & Spl., force feed and splash.

IGNITION MAKE: At. Kent., Atwater Kent; Conn., Connecticut; D.-Bijur, Delco and Bijur; Else., Eisemann; G. & D., Gray & Davis; Split., Splitdorf; West., Westinghouse; West., B., Westinghouse and Bosch.

IGNITION CONTROL: Auto., automatic; Hand, manual; H. & A., hand and automatic.

CARBURETOR: Hol.-Kgn., Holley and Kingston; Loco. B. & B., Locomobile and Ball & Ball; Ray. or Strom., Rayfield or Stromberg.

STARTING AND LIGHTING: Heinze-Spring., Heinze-Springfield; Pil. or Auto L., Pilliod or Auto Lite; Stud.-Wagner, Studebaker-Wagner; West., Westinghouse.

GEARSET: Plan-Unit, M., planetary, in unit with engine; Selec-Amid., selective, amidships; S-Unit, M., selective, in unit with engine; S-Unit, X, selective, in unit with rear axle.

TIRES: F. & R., front and rear wheels carry same size tires; colon between figures indicates sizes for two models; coma between figures indicates sizes of rear and front wheels on one model.

SPRINGS: Double Cantl., double cantilever; $\frac{1}{2}$ Ell. Cant., semi-elliptic cantilever.

BEARINGS: B. & R., ball and roller.

the cowl, or one under the seat, to the carburetor. In the vacuum system engine suction in an auxiliary tank connected with the carburetor and a tank at the rear draws the fuel to the vacuum tank from which it flows by gravity to the carburetor. In the pressure system the fuel is forced by air pressure from the rear tank direct to the carburetor.

Type of Clutch—Under this classification disc includes single and multiple plate types and those that run either in oil or dry. The cone type is too familiar to need explanation.

Type of Gearset—Selective refers to the type in which any speed is reached direct. The planetary system is distinctive because when in second speed the whole gearset turns as a unit, while the internal gears do not revolve around each other. In the progressive type it is necessary first to pass through first speed to reach higher ones. Friction drive is by a friction disc pressing against a driven disc attached to a shaft that turns the wheels. Unit with motor indicates that the gearset and clutch housings are integral with the engine—a unit power plant. Unit with rear axle means the gearset is integral with the axle housing, while amidships shows that the gearset is midway between the axle and engine.

Drive Through—This refers to whether there is a torque tube surrounding the propeller shaft, or a torque arm placed along side the shaft from the differential to a frame cross member, while springs refer to the Hotchkiss drive in which propulsion is through the rear springs.

Type of Rear Axle—In the full floating type the weight is carried on the axle housing and the axle is flexibly attached to the wheels. The $\frac{1}{2}$ floating is similar to the full floating except that the axle is permanently attached to the wheels. In the $\frac{1}{2}$ floating the bearings are in the axle housing and the axle shaft not only turns the wheels, but helps support the load. The dead type is found only in cars driven by chains, the axle being stationary.

Direct Drive Ratio—The relation of the speed of the crankshaft to that of the wheels on high gear is the reference here; in other words, if the engine turns over three times to one revolution of the rear wheels on direct then the ratio is three to one.

Rear Springs—Elliptic springs take their names from their shapes. The elliptic has the form of a full ellipse; in the $\frac{1}{2}$ elliptic half of the upper member is missing; in the $\frac{1}{4}$ elliptic, simply the lower portion is used. The cantilever type appears to be the $\frac{1}{2}$ elliptic turned upside down. Transverse types are usually of the $\frac{1}{2}$ elliptic type placed across the rear of the car. The platform type has the $\frac{1}{2}$ elliptic on the sides and another transversely mounted and connected with the side members.

FOUR-CYLINDER AMERICAN MADE GASOLINE PLEASURE CARS FOR 1917.

Data Regarding Prices, Seating Capacities and Body Types Are Given in the General Indexes.

Name of Car	Allen	Altercar	Amc Sterling	Arbeus	Auburn	Bell	Biddle	Brewster	Briscoe
No. or Name of Model	37	E-17	1917	25	4-36U	17	D	Standard	B 4-24
Bore and Stroke	3.750x5.000	3.125x4.500	3.125x4.500	3.260x5.000	3.687x4.000	3.500x5.000	3.750x5.125	4.000x5.500	3.187x5.125
Horsepower (S. A. E.)	22.0	14.40	14.40	16.90	21.76	19.60	22.50	25.60	16.25
Piston Displacement	220.9	126.5	120.2	165.9	220.9	192.4	226.4	276.5	162.5
Cylinders, Shape, Cast	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block
Who Makes Motor	Allen	LeRol	Milwaukee	Lycoming	Tector	Lycoming	Right	Knights	Briscoe
Location of Valves	Right	Right	Right	Left	Helical	Right	Biddle	Sleeve	Right
Type Camshaft Drive	Helical	Gear	Helical	Helical	Helical	Helical	Helical	Chain	Helical
Type Cooling System	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Pump	Ther.-Syp.	Ther.-Syp.	Pump	Ther.-Syp.
Lubrication System	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	Splash	Splash	Splash	F. F. & Spl.	Force F.	F. F. & Spl.
Oil Pump	Plunger	Plunger	Plunger	Plunger	Plunger	Plunger	Gear	Gear	Plunger
Ignition System Type	Single	Single	Single	Single	Single	Single	Single	Single	Single
Make and Control	West, hand	Allis Chalmers	Bosch, hand	Conn., hand	Conn., hand	At. Kent, hand	Bosch, hand	Bosch, hand	Conn., hand
Make of Carburetor	Stromberg	Schebler	Stromberg	Carter	Rayfield	Carter	Zenith	Zenith	Bulck-Carter
Method of Fuel Feed	Vacuum	Vacuum	Gravity	Gravity	Vacuum	Vacuum	Vacuum	Vacuum	Gravity
Starting System Make	West.	Allis Chalmers	Bosch	Disco	Auto-Lite	Gray & Davis	U. S. L.	U. S. L.	Splitdorf
Lighting System Make	U. S. L.	Allis Chalmers	Bosch	Disco	Auto-Lite	Gray & Davis	U. S. L.	U. S. L.	Splitdorf
Type of Clutch	Cone	Disc	S-Unit, M	S-Unit, M	Disc	Disc	Disc	Cone	Cone
Speed Ratios	Three	Three	Three	Three	Three	Three	Four	Three	Three
Type of Rear Axle	Full float.	Three	Three	Three	Three	Three	Three	Three	Three
Direct Drive Ratio	112 inches	450-1	435-1	425-1	400-1	400-1	400-1	332-1	423-1
Wheelbase	122 inches	110 inches	114 inches	108 inches	114 inches	112 inches	122 inches	125 inches	104 inches
Sizes of Tires	33x4. F. & R.	32x3 1/4 F. & R.	30x3 1/4 F. & R.	30x3 1/4 F. & R.	31x4 F. & R.	31x4 F. & R.	32x4 F. & R.	34x4 1/4 F. & R.	30x3 1/4 F. & R.
Wheels (Wood or Wire)	Wire	Wood	Wood	Wood	Wood	Wood	Wire	Wood	Wood
Type of Rear Springs	1/2 elliptic	1/2 elliptic	1/2 elliptic	Cantilever	1/2 elliptic	1/2 elliptic	1/2 elliptic	Cantilever	Elliptic
Drive and Control	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Right, right	Left, centre
Type Gearset Bearings	Ball	Roller	Roller	Ball	Ball	Ball	Ball	Ball	B. & R.
Rear Axle Bearings	Ball	Roller	Roller	Roller	Ball	Roller	Ball	Roller	B. & R.
Front Axle Bearings	Ball	Ball	Ball	Ball	Ball	Ball	Ball	Roller	Ball
No. Eng. Main Bearings	Two	Two	Two	Two	Three	Three	Three	.....	Two

Name of Car	Brunswick	Buick	Chevrolet	Chevrolet	Chevrolet	Classic	Crow-Duryea	Crow-Elkhart	Diapatch
No. or Name of Model	36	D-4-34 & 35	4-50	4-50	4-50	.....	35	35	G
Bore and Stroke	4.750x5.500	3.375x4.750	3.625x6.000	3.687x4.000	3.687x4.000	3.500x5.000	3.750x4.250	3.500x5.000	3.750x5.000
Horsepower (S. A. E.)	36.10	18.23	21.03	21.76	21.76	37.00	22.50	19.60	22.50
Piston Displacement	389.9	170.0	247.7	170.9	170.9	192.5	187.7	192.4	320.9
Cylinders, Shape, Cast	4-T-2s	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block
Who Makes Motor	Wisconsin	Case	Case	Chevrolet	Chevrolet	Lycoming	Lycoming	Lycoming	Wisconsin
Location of Valves	R. & L.	Head	Right	Head	Head	Right	Head	Right	Left
Type Camshaft Drive	Gear	Helical	Chain	Helical	Helical	Helical	Helical	Helical	Helical
Type Cooling System	Pump	Pump	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.
Lubrication System	Force F.	Splash	F. F. & Spl.	Splash	Splash	Splash	F. F. & Spl.	Splash	Force F.
Oil Pump	Single	Gear	Plunger	Plunger	Plunger	Gear	Plunger	Plunger	Gear
Ignition System Type	Single	Single	Single	Single	Single	Delco	Single	Single	Single
Make and Control	Bosch, hand	Delco, hand	Conn., hand	Conn., hand	Conn., hand	Delco	Conn., hand	Conn., hand	Bosch, hand
Make of Carburetor	Rayfield	Marvel	Rayfield	Zenith	Zenith	Schebler	Schebler	Zenith	Rayfield
Method of Fuel Feed	Vacuum	Vacuum	Gravity	Gravity	Gravity	Vacuum	Gravity	Gravity	Gravity
Starting System Make	West.	Delco	Auto-Lite	Auto-Lite	Auto-Lite	Dyneto	Dyneto	Dyneto	U. S. L.
Lighting System Make	West.	Delco	Auto-Lite	Auto-Lite	Auto-Lite	Dyneto	Splitdorf	Splitdorf	U. S. L.
Type of Clutch	Disc	Cone	S-Unit, M	S-Unit, M	S-Unit, M	Cone	Special	Disc	Special
Type of Gearset	Three	Three	Three	Three	Three	Three	Three	Three	Four
Speed Ratios	Three	Three	Three	Three	Three	Three	Three	Three	Four
Type of Rear Axle	Full float.	Three	Torque rod	Three	Three	Springs	Torque tube	Torque tube	Radius rod
Direct Drive Ratio	120 inches	410-1	410-1	367-1	367-1	450-1	Dead	Full float.	Dead
Wheelbase	120 inches	106 inches	120 inches	102 inches	102 inches	114 inches	114 inches	114 inches	120 inches
Sizes of Tires	32x4 1/4 F. & R.	31x4 F. & R.	32x4 1/4 F. & R.	30x3 1/4 F. & R.	30x3 1/4 F. & R.	32x4 F. & R.	32x3 1/4 F. & R.	32x3 1/4 F. & R.	36x3 1/4 F. & R.
Wheels (Wood or Wire)	Wire	Wood	Wood	Wood	Wood	Optional	Wood	Wood	Wood
Type of Rear Springs	1/2 elliptic	1/2 elliptic	Cantilever	Cantilever	Cantilever	1/2 elliptic	1/2 elliptic	1/2 elliptic	Elliptic
Drive and Control	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, right
Type Gearset Bearings	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
Rear Axle Bearings	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
Front Axle Bearings	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
No. Eng. Main Bearings	Three	Three	Three	Three	Three	Two	Two	.....	Two

Name of Car	Dixie Flyer	Dodge Bros.	Dort	Drexel	Dunn	Emerson	Empire	Erie	Flat
No. or Name of Model	1917	3875x4.500	3.250x5.000	3.500x5.000	3.000x4.000	Four	45	35x34	55-E17
Bore and Stroke	3.250x5.000	24.03	16.90	19.60	14.40	3.750x4.000	3.875x5.000	3.750x4.250	5.125x6.750
Horsepower (S. A. E.)	16.90	212.3	165.9	192.0	113.1	176.7	235.8	22.50	42.03
Piston Displacement	165.9	4-L-Block	4-L-Block	4-L-Block	4-L-Block	Emerson	4-L-Block	4-L-Block	4-L-Block
Cylinders, Shape, Cast	Lycoming	Dodge	Dort	Drexel	Dunn	Right	Teetor	G. B. & S.	4-L-Block
Who Makes Motor	Lycoming	Right	Helical	Chain	Right	Emerson	R. & L.	Left	Helical
Location of Valves	Helical	F. F. & Spl.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Helical	Gear	Force F.
Type Camshaft Drive	Ther.-Syp.	F. F. & Spl.	Plunger	Plunger	Plunger	Splash	Ther.-Syp.	Ther.-Syp.	Force F.
Lubrication System	F. F. & Spl.	Vane	Single	Single	Single	Single	Plunger	Gear	Dual
Oil Pump	Double	Delco, auto.	Conn., hand	Bosch, hand	At. Kent	Single	Single	Gear	Bosch, hand
Ignition System Type	Conn., hand	Stewart	Cartier	Stromberg	Gravity	At. Kent	Conn., hand	Stromberg	Zenith-Flat
Make and Control	Cartier	Vacuum	Gravity	Gravity	Gravity	Vacuum	Vacuum	Gravity	Pressure
Method of Fuel Feed	Vacuum	North East	West.	Bijur	Dyneto	Apelco	Auto-Lite	Dyneto	West.
Starting System Make	Dyneto	North East	West.	Disc	Cone	Disc	Auto-Lite	Disc	West.
Lighting System Make	Cone	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	Cone	Disc	Disc
Type of Clutch	S-Unit, M	Three	Three	Three	Three	Three	S-Unit, M	S-Unit, M	Selec.-Amld.
Type of Gearset	Three	Full float.	Full float.	Full float.	Full float.	Full float.	Full float.	Three	Four
Drive Through	Full float.	3.615-1	4.41-1	4.25-1	4.25-1	4.25-1	4.00-1	4.00-1	Torque tube
Type of Rear Axle	Full float.	114 inches	105 inches	112 inches	84 inches	110 inches	116 inches	118 inches	140 inches
Direct Drive Ratio	4.75-1	32x3 1/2 F. & R.	32x3 1/2 F. & R.	32x3 1/2 F. & R.	28x3 1/2 F. & R.	30x3 1/2 F. & R.	33x4 F. & R.	33x4 F. & R.	35x5 F. & R.
Wheelbase	112 inches	Wood	Wood	Wood	Wire	Wood	Wood	Optional	Wood
Sizes of Tires	32x3 1/2 F. & R.	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic
Wheels (Wood or Wire)	Wood	Cantilever	Cantilever	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic
Type of Rear Springs	% elliptic	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Right
Drive and Control	Left, centre	Ball	Ball	Ball	Ball	Ball	Ball	Ball	Ball
Type Gearset Bearings	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Ball
Rear Axle Bearings	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Ball
Front Axle Bearings	Ball	Ball	Ball	Ball	Ball	Ball	Ball	Ball	Ball
No. Eng. Main Bearings	Two	Three	Two	Two	Two	Three	.....	Three	Three

Name of Car	Ford	F. R. P.	F. R. P.	Ghent	Great Eagle	Harrold	Harvard	Hatfield	Heseltine
No. or Name of Model	T	45-A	45-B	Four 30	4-50	Four	4-25	A, H & L.	.....
Bore and Stroke	3.750x4.000	4.600x6.750	4.600x6.750	3.750x4.250	4.750x5.500	3.750x4.250	3.000x4.250	3.750x4.250	3.125x4.500
Horsepower (S. A. E.)	22.50	33.80	33.80	22.50	30.60	16.90	16.90	22.50	16.90
Piston Displacement	176.7	448.0	448.0	187.7	389.9	174.2	120.20	187.7	138.4
Cylinders, Shape, Cast	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block
Who Makes Motor	Ford	Porter	Porter	G. B. & S.	Wisconsin	Sterling	Sterling	G. B. & S.	LeRol
Location of Valves	Right	Head	Worm	Right	R. & L.	Head	Head	Right	Right
Type Camshaft Drive	Sour	Pump	Pump	Ther.-Syp.	Pump	Ther.-Syp.	Ther.-Syp.	Chain	Gear
Lubrication System	Ther.-Syp.	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	Force F.	F. F. & Spl.	F. F. & Spl.	Ther.-Syp.	Ther.-Syp.
Oil Pump	Splash	Plunger	Plunger	Plunger	.....	.....	.....	.....	Plunger
Ignition System Type	Single	Single	Single	Double	Single	Single	Single	Single	Single
Make and Control	Ford, hand	Bosch, hand	G. & D., hand	Conn., hand	Conn., hand	Conn., hand	At. Kt., hand	Conn., hand	Bosch, hand
Method of Fuel Feed	Hol-Ken.	Longuemare	Longuemare	Cartier	Cartier	Special	Zenith	Stromberg	Gem
Starting System Make	Gravity	Pressure	Pressure	Vacuum	Vacuum	Gravity	Gravity	Vacuum	Gravity
Lighting System Make	None	Bosch	Bosch	Gray & Davis	West.	Dyneto	Wagner	Dyneto	Allis-Chalmers
Type of Clutch	Disc	Cone	Cone	Disc	Disc	Cone	Cone	Disc	Disc
Type of Gearset	Plan.-Unit, M	Selec.-Amld.	Selec.-Amld.	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M
Drive Through	Two	Four	Four	Three	Three	Three	Three	Three	Three
Type of Rear Axle	% float.	Full float.	Full float.	% float.	% float.	% float.	% float.	% float.	% float.
Direct Drive Ratio	3.63-1	3.00-1	3.00-1	4.25-1	4.08-1	4.00-1	4.00-1	4.25-1	.....
Wheelbase	100 inches	140 inches	140 inches	120 inches	143 inches	107 inches	100 inches	115 & 106 in.	106 inches
Sizes of Tires	30x3 1/2	32x4, 33x4 1/2	32x4, 33x4 1/2	31x4 F. & R.	37x5 F. & R.	30x3 1/2 F. & R.	28x3 1/2 F. & R.	32x4 F. & R.	30x3 1/2 F. & R.
Wheels (Wood or Wire)	Wood	Wire	Wire	Steel	Wood	Wood	Optional	Wood	Wood
Type of Rear Springs	Transverse	Right	% elliptic	% elliptic	Platform	Cantilever	Cantilever	% ell. cant.	% elliptic
Drive and Control	Left	Ball	Ball	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre
Type Gearset Bearings	.....	Ball	Ball	Ball	Roller	.....	Ball	Ball	.....
Rear Axle Bearings	Roller	Ball	Ball	Ball	Roller	.....	B. & R.	Roller	.....
Front Axle Bearings	Roller	Ball	Ball	Ball	Roller	.....	Ball	Ball	.....
No. Eng. Main Bearings	Three	.....	.....	Three	Three	.....	.....	Three	.....

FOUR-CYLINDER AMERICAN MADE GASOLINE PLEASURE CARS FOR 1917.

Data Regarding Prices, Seating Capacities and Body Types Are Given in the General Indexes.

Name of Car	Hupmobile	Inter-State	Jeffery	Kent	Lambert	Laurel	Lozier	Matson	Malbohm
No. or Name of Model	N	Six Models	4	.....	80	36	84	A	A
Bore and Stroke	3.750x5.500	3.500x5.000	3.750x5.250	3.750x5.000	4.000x4.500	4.250x4.250	4.250x4.500	3.000x4.250	3.125x4.000
Horsepower (S. A. E.)	22.50	19.50	22.50	22.50	30.00	22.50	28.00	14.40	15.625
Piston Displacement	242.0	192.4	231.9	220.9	149.3	187.7	368.8	120.2	122.7
Cylinders, Shape, Cast	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block
Who Makes Motor	Hupmobile	R. & B.	Nash	Continental	Continental	G. B. & S.	Lozier	Head	Malbohm
Location of Valves	Left	Left	Right	Right	Right	Right	Right	Head	Head
Type Camshaft Drive	Chain	Gear	Helical	Helical	Spur	Spur	Chain	Helical	Helical
Type Cooling System	Ther.-Syp.	Ther.-Syp.	Pump	Ther.-Syp.	Pump	Pump	Pump	Ther.-Syp.	Ther.-Syp.
Lubrication System	Force F.	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	Spash	Spash	Force F.	F. F. & Spl.	F. F. & Spl.
Oil Pump	Gear	Gear	Plinger	Gear	.....	.....	Gear	.....	Gear
Ignition System Type	Single	Single	Single	Single	Single	Single	Duplex	Single	Single
Make and Control	At. Kt., H. & A.	Remy, hand	Dixie, hand	Bosch, hand	Remy, auto.	Remy, auto.	Bosch, hand	.....	At. Kt., hand
Method of Fuel Feed	Grav.	Schebler	Stromberg	vacuum	Schebler	Schebler	Stewart	Zenith	Grav.
Starting System Make	West	Remy	Bijur	Bosch	Remy	Remy	Gray & Davis	Wagner	Disco
Lighting System Make	West	Remy	Bijur	Bosch	Remy	Remy	Gray & Davis	Wagner	Disco
Type of Clutch	Disc	Cone	Disc	Disc	Friction	Friction	Disc	Disc	Disc
Type of Gearset	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	.....	.....	S-Unit, M	S-Unit, M	S-Unit, M
Speed Ratios	Three	Three	Three	Three	Three	Three	Four	Three	Three
Drive Through	.....	Torque tube	.....	.....	.....	.....	.....	.....	.....
Type of Rear Axle	.....	% float.	% float.	% float.	% float.	% float.	Full float.	% float.	% float.
Direct Drive Ratio	4.64-1	4.00-1	4.00-1	4.08-1	3.00-1	4.25-1	1.00-1	.....	4.00-1
Wheelbase	119 & 134 in.	110 inches	116 inches	116 inches	120 inches	120 inches	120 inches	114 inches	105 inches
Sizes of Tires	34x4, 35x4 1/2	33x4 F. & R.	34x4 F. & R.	32x4 F. & R.	34x4 F. & R.	34x4 F. & R.	36x4 1/2 F. & R.	32x3 1/2 F. & R.	30x3 1/2 F. & R.
Wheels (Wood or Wire)	Wood	Wood	Wood	Optional	Wood	Wood	Wood	Wood	Optional
Type of Rear Springs	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic	Platform	% elliptic	% elliptic
Drive and Control	Left, centre	Left, centre	Left, centre	Left, Right	Right, right	Right, right	Left, centre	Left, centre	Left, centre
Type Gearset Bearings	B. & R.	Roller	Roller	Roller	Roller	Roller	Roller	.....	Ball
Rear Axle Bearings	Ball	Roller	Roller	Roller	Roller	Roller	Roller	.....	Ball
Front Axle Bearings	Roller	Ball	Roller	Roller	Ball	Ball	Roller	.....	Ball
No. Eng. Main Bearings	Three	Three	Three	.....	Three	Three	Three	.....	Two

Name of Car	Maxwell	Mercer	Metz	Miltaire	Moline-Knight	Moline-Knight	Monitor	Monroe	Moore
No. or Name of Model	25	22-73	25	8	40-O	G	C. & R.	M-3	H. G. M.
Bore and Stroke	3.925x4.500	3.750x4.750	3.875x4.000	2.625x3.000	3.750x5.000	4.000x6.000	3.750x4.250	3.000x4.250	3.750x4.250
Horsepower (S. A. E.)	21.03	22.50	24.02	11.55	25.00	25.00	22.50	14.05	22.50
Piston Displacement	185.8	238.2	183.7	68.0	220.9	301.6	187.7	130.2	187.9
Cylinders, Shape, Cast	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block
Who Makes Motor	Maxwell	Mercer	Metz	Miltaire	Mol-Knight	Mol-Knight	Monroe	Sterling	Special
Location of Valves	Right	Right	Right	Left	Sleeve	Sleeve	Head	Head	Left
Type Camshaft Drive	Helical	Chain	Spur	Spur	Chain	Chain	Helical	Helical	Chain
Type Cooling System	Ther.-Syp.	Pump	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.
Lubrication System	F. F. & Spl.	Force F.	Spash	Force F.	Force F.	Force F.	Force F.	Spash	F. F. & Spl.
Oil Pump	Plunger	Gear	Gear	Gear	Gear	Gear	Gear	Piston	.....
Ignition System Type	Single	Single	Single	Single	Single	Single	Single	Single	Single
Make and Control	At. Kt., hand	Bosch, hand	Dixie, hand	Bosch, hand	Conn., hand	Conn., hand	Conn., hand	Conn., hand	Dixie, hand
Method of Fuel Feed	K. D.	Corser	A. W. T.	Schebler	Schebler	Schebler	Zenith	Zenith	Schebler
Starting System Make	Grav.	Vacuum	Grav.	Grav.	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum
Lighting System Make	Simms-Huff	U. S. L.	Gray & Davis	Mechanical	Auto-Lite	Auto-Lite	Auto-Lite	Auto-Lite	Disco
Type of Clutch	Simms-Huff	U. S. L.	Gray & Davis	None	Wagner	Wagner	Auto-Lite	Auto-Lite	Disco
Type of Gearset	Cone	Disc	.....	Disc	Cone	Cone	Disc	Disc	Disc
Speed Ratios	S-Unit, M	Selec. Amid.	Metz, gearless	S-Unit, M	Selec.-Amid.	Selec.-Amid.	S-Unit, M	S-Unit, M	S-Unit, M
Drive Through	Three	Four	Seven	Three	Three	Three	Three	Three	Three
Type of Rear Axle	% float.	Full float.	Special	Full float.	% float.	% float.	% float.	% float.	Full float.
Direct Drive Ratio	3.58-1	.....	.....	4.00-1	4.00-1	4.00-1	4.75-1	4.25-1	3.875-1
Wheelbase	103 inches	115 and 132 in.	108 inches	65 inches	118 inches	122 inches	115 inches	96 inches	106 inches
Sizes of Tires	30x3 1/2 F. & R.	32x4, 34x4 1/2	32x3 1/2 F. & R.	32x3 1/2 F. & R.	36x4 1/2 F. & R.	36x4 1/2 F. & R.	32x3 1/2 F. & R.	30x3 1/2 F. & R.	30x3 1/2 F. & R.
Wheels (Wood or Wire)	Wood	Optional	Optional	Wood	Wood	Wood	Wood	Wood	Wood
Type of Rear Springs	% elliptic	% elliptic	% elliptic	None	Special	Special	% elliptic	% elliptic	Cantilever
Drive and Control	Left, centre	Left, centre	Left, centre	Centre, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre
Type Gearset Bearings	Roller	Ball	None	Ball	Ball	Ball	Ball	Ball	Ball
Rear Axle Bearings	Roller	Ball	Roller	Ball	Roller	Roller	Roller	B. & R.	Ball
Front Axle Bearings	Ball	Roller	Ball	Ball	Roller	Roller	Roller	B. & R.	Ball
No. Eng. Main Bearings	Two	Three	Three	Three	Three	Three	Three	Two	Three

Name of Car.	Napoleon	Olympian	Overland	Overland	Packet	Partin-Palmer	Partin-Palmer	Penny	Phaena	Pilgrim
No. or Name of Model.	30	3750x4.250	36-A	Country Club	3.500x5.000	3.125x4.500	3.500x5.000	3.500x5.000	3.906x4.250	3.906x4.250
Bore and Stroke.	18.60	22.50	27.20	3.375x5.000	19.60	15.63	19.60	19.60	24.00	23.00
Horsepower (S. A. E.).	19.60	187.9	240.0	18.25	192.4	138.1	192.4	192.4	292.2	187.9
Piston Displacement.	192.4	187.9	240.0	179.0	192.4	138.1	192.4	192.4	292.2	187.9
Cylinders, Shape, Cast.	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block	4-L-Block
Who Makes Motor.	G. B. & S.	G. B. & S.	Overland	Overland	Lycoming	LeRoi	Lycoming	Lycoming	Phlanna	G. B. & S.
Location of Valves.	Right	Right	Right	Right	Right	Right	Right	Right	Right	Left
Type Camshaft Drive.	Helical	Helical	Helical	Helical	Chain	Helical	Helical	Gear	Chain	Chain
Type Cooling System.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.
Lubrication System.	F. F. & Spl.	F. F. & Spl.	Splash	Splash	F. F. & Spl.	Splash	Splash	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.
Oil Pump.	Plunger	Plunger	Gear	Plunger	Plunger	Plunger	Plunger	Plunger	Gear	Gear
Ignition System Type.	Dual	Single	Conn., hand	Conn., hand	Single	Single	Single	Single	Single	Single
Make and Control.	Conn., H. & A.	Conn., auto.	Tillotson	Tillotson	At. Kent	Conn., hand	Conn., hand	Conn., hand	H. & N.	Zenith
Method of Fuel Feed.	Carb.	Vacuum	Vacuum	Vacuum	Gravity	Gravity	Gravity	Vacuum	Vacuum	Vacuum
Spraying System Make.	Dyneto	Auto-Lite	Auto-Lite	Auto-Lite	Auto-Lite	Allis Chalmers	Dyneto	Dyneto	Ward-Leonard	Ward-Leonard
Lighting System Make.	Dyneto	Auto-Lite	Auto-Lite	Auto-Lite	Auto-Lite	Allis Chalmers	Disco	Dyneto	Ward-Leonard	Ward-Leonard
Type of Clutch.	Disc	Disc	Cone	Cone	Disc	Disc	Disc	Disc	Disc	Disc
Type of Gearset.	S-Unit, M	S-Unit, M	S-Unit, X	S-Unit, X	Friction	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M
Speed Ratios.	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
Drive Through.	Torque rods	Torque rod	Torque rod	Torque rod	Chain	Radius rods	Springs	Springs	Springs	Springs
Type of Rear Axle.	Full float.	Full float.	% float.	% float.	Dead	Full float.	% float.	% float.	Full float.	Full float.
Direct Drive Ratio.	4.00-1	4.50-1	4.00-1	3.75-1	4.00-1	4.00-1	4.00-1	4.00-1	4.00-1	4.00-1
Wheelbase.	112 inches	114 inches	112 inches	104 inches	100 inches	96 inches	110 inches	115 inches	125 inches	112 inches
Sizes of Tires.	31x4 F. & R.	32x3 1/2 F. & R.	32x4 F. & R.	31x4 F. & R.	28x3 F. & R.	30x3 1/2 F. & R.	32x3 1/2 F. & R.	32x4 F. & R.	32x3 1/2 F. & R.	32x3 1/2 F. & R.
Wheels (Wood or Wire)	Wood	Optional	Wood	Wire	Wood	Wood	Wood	Wood	Optional	Wood
Type of Rear Springs.	Cantilever	Cantilever	Cantilever	Cantilever	Wire	% elliptic	% elliptic	% elliptic	Cantilever	% elliptic
Drive and Control.	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Centre, centre	Left, centre
Type Gearset Bearings.	Ball	Ball	B. & R.	B. & R.	.....	Ball	Ball	Ball	Ball	Ball
Rear Axle Bearings.	Roller	B. & R.	B. & R.	B. & R.	.....	Ball	B. & R.	B. & R.	Roller	B. & R.
Front Axle Bearings.	Ball	Ball	Roller	Roller	.....	Ball	Ball	Ball	B. & R.	B. & R.
No. Eng. Main Bearings	Two	Three	Five	Two	Two	Two	Two	Two	Three	Three



Name of Car.	Pillod	Princess	Pullman	Regal	Reo	Ri-Chard	Ruler	Saxon	Semeca	States
No. or Name of Model.	F	4-28	424	J	R	1917	.....	B5R B5R	4-27	B
Bore and Stroke.	4.125x5.000	3.750x4.250	3.750x4.250	3.500x4.750	4.125x4.500	4.000x9.000	3.250x5.000	2.750x4.000	3.121x4.500	3.750x4.250
Horsepower (S. A. E.).	28.00	22.50	22.50	19.60	27.23	25.60	16.90	12.10	16.90	25.00
Piston Displacement.	287.3	187.7	187.7	183.0	240.5	.....	165.9	95.0	141.0	188.0
Cylinders, Shape, Cast.	4-L-Block	4-L-Block	4-L-Block	4-L-Block	Reo	Ri-Chard	4-L-Block	4-L-Block	4-L-Block	4-L-Block
Who Makes Motor.	Pillod	G. B. & S.	G. B. & S.	Regal	R. & H.	Side	Continental	LeRoi	LeRoi	G. B. & S.
Location of Valves.	Sleeve	Left	Right	Left	Helical	Helical	Head	Right	Right	Left
Type Camshaft Drive.	Chain	Helical	Chain	Helical	Pump	Helical	Chain	Helical	Gear	Chain
Type Cooling System.	Pump	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Splash	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.
Lubrication System.	Force F.	F. F. & Spl.	Splash	Splash	Plunger	Force F.	Splash	Splash	Splash	F. F. & Spl.
Oil Pump.	Gear	.....	.....	Plunger	Plunger	.....	.....	Plunger	Plunger	Plunger
Ignition System Type.	Single	.....	Single	Single	Single	Single	.....	Single	Single	Single
Make and Control.	Conn., hand	Splitdorf, hand	Splitdorf, hand	Heinze, hand	Remy, hand	Bosch, H. & A.	At. Kt., auto.	Remy, hand	Remy, hand	Conn., hand
Method of Fuel Feed.	Stewart	Schebler	Stromberg	Cartier	Johnson	Ri-Chard	Reichenbach	Zenith	Zenith	Schebler
Starting System Make.	Vacuum	Vacuum	Vacuum	Vacuum	Johnson	Vacuum	Gravity	Vacuum	Vacuum	Vacuum
Lighting System Make.	Pil or Auto	Apelco	Apelco	Heinze-Spring.	Remy	West.	Wagner	Allis Chalmers	Allis Chalmers	Dyneto
Type of Clutch.	Pil or Auto	L. Disco	Disco	Heinze-Spring.	Disco	West.	.....	Wagner	Allis Chalmers	Dyneto
Type of Gearset.	S-Unit, M	Disco	Disco	Cone	Disco	Cone	Disc	Disc	Disc	Disc
Speed Ratios.	Three	S-Unit, M	S-Unit, M	S-Unit, M	Selec.-Amld.	.....	S-Unit, M	S-Unit, X	S-Unit, M	S-Unit, M
Drive Through.	Torque arm	Three	Three	Three	Three	Three	Three	Three	Three	Three
Type of Rear Axle.	Full float.	Springs	Springs	Torque rod	Springs	Full float.	Full float.	Torque rod	Springs	Springs
Direct Drive Ratio.	4.09-1	4.50-1	4.50-1	4.25-1	4.307-1	2.00-1	.....	5.00-1	4.00-1	4.00-1
Wheelbase.	120 inches	108 inches	114 inches	108 inches	115 inches	137 inches	120 inches	96 inches	108 inches	112 inches
Sizes of Tires.	34x4 F. & R.	32x3 1/2 F. & R.	31x4 F. & R.	30x3 1/2 F. & R.	34x4 F. & R.	34x6 F. & R.	32x3 F. & R.	30x3 F. & R.	30x3 1/2 F. & R.	32x3 1/2 F. & R.
Wheels (Wood or Wire)	Wood	Wood	Wood	Wood	Wood	Optional	Wire	Wood	Wood	Wood
Type of Rear Springs.	Cantilever	Cantilever	Cantilever	Cantilever	% elliptic	% elliptic	Cantilever	Cantilever	Cantilever	% elliptic
Drive and Control.	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre
Type Gearset Bearings.	Ball	Ball	Ball	Ball	Roller	Ball	Left, centre	Plain	B. & R.	Ball
Rear Axle Bearings.	Ball	Ball	Roller	Roller	Roller	Ball	.....	Roller	B. & R.	B. & R.
Front Axle Bearings.	Ball	Ball	Ball	Ball	Roller	Ball	.....	Ball	Ball	Ball
No. Eng. Main Bearings	Three	Three	Three	Three	Three	Three	Two	Two	Two	Three

FOUR-CYLINDER AMERICAN MADE GASOLINE PLEASURE CARS FOR 1917.

Data Regarding Prices, Seating Capacities and Body Types Are Given in the General Indexes.

Name of Car	Stearns-Knight	Studebaker	Statz	Templar	Trumbull	Wayne	White	White	Willis-Knight
No. or Name of Model	32	4-40	R. & B'ldog S.	445	16 B	4-35	16-valve "4"	16 Valve 4	SS-4
Horsepower (S. A. E.)	18.23	3,875x5,000	4,750x5,500	3,375x5,500	2,875x4,000	4,000x4,500	4,250x5,750	4,125x4,500	4,125x4,500
Piston Displacement	226.4	235.8	349.9	197.0	103.7	226.2	28.90	28.90	27.25
Cylinders, Shape, Cast	4-L-Block	4-L-Block	4-L-2s	4-L-Block	4-L-Block	4-L-Block	4-T-Block	4-T-Block	4-L-Block
Who Makes Motor	Stearns	Studebaker	Wisconsin	Templar	Milwaukee	Wayne	White	White	Willis-Knight
Location of Valves	Sleeve	Left	R. & L.	Head	Right	Right	R. & L.	R. & L.	Right
Type Camshaft Drive	Gear	Helical	Spur	Chain	Helical	Gear	Helical	Helical	Helical
Type Cooling System	Pump	Pump	Pump	Pump	Ther.-Syp.	Ther.-Syp.	Force F.	Force F.	Ther.-Syp.
Lubrication System	F. F. & Spl.	Splash	Force F.	Force F.	Splash	F. F. & Spl.	Force F.	Force F.	Force F.
Oil Pump	Gear	Gear	Gear	Gear	Plunger	.....	Gear	Gear	Plunger
Ignition System	Single	Single	Single	Single	Single	Single	Single	Single	Single
Make and Control	.....	.....	.....	.....	.....	.....	.....	.....	.....
Method of Carburetor	.....	.....	.....	.....	.....	.....	.....	.....	.....
Method of Fuel Feed	.....	.....	.....	.....	.....	.....	.....	.....	.....
Starting System	Make. West.	Stud.-Wagner	Remy	Remy	Ward-Leonard	Apelco	Leece-Neville	Leece-Neville	Auto-Lite
Lighting System	Make. West.	Stud.-Wagner	Remy	Remy	Ward-Leonard	Apelco	Leece-Neville	Leece-Neville	Auto-Lite
Type of Clutch	.....	.....	.....	.....	.....	.....	.....	.....	.....
Type of Gearset	.....	.....	.....	.....	.....	.....	.....	.....	.....
Speed Ratios	.....	.....	.....	.....	.....	.....	.....	.....	.....
Drive Through	.....	.....	.....	.....	.....	.....	.....	.....	.....
Type of Rear Axle	.....	.....	.....	.....	.....	.....	.....	.....	.....
Direct Drive Ratio	4.50-1	4.00-1	3.06-1	4.43-1	3.60-1	1/2 float.	1/2 float.	1/2 float.	4.30-1
Wheelbase	119 inches	112 inches	130 inches	120 inches	80 inches	110 inches	124 1/2 inches	124 1/2 inches	121 inches
Sizes of Tires	34x4 F. & R.	35x4 1/2 F. & R.	34x4 1/2 F. & R.	32x4 F. & R.	32x4 F. & R.	32x4 F. & R.	37x5 F. & R.	37x5 F. & R.	34x4 1/2 F. & R.
Wheels (Wood or Wire)	Wood	Wood	Wire	Optional	Wire	Wood	Wood	Wood	Wood
Type of Rear Springs	.....	.....	.....	.....	.....	.....	.....	.....	.....
Drive and Control	.....	.....	.....	.....	.....	.....	.....	.....	.....
Type Gearset Bearings	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rear Axle Bearings	.....	.....	.....	.....	.....	.....	.....	.....	.....
Front Axle Bearings	.....	.....	.....	.....	.....	.....	.....	.....	.....
No. Eng. Main Bearings	Three	Three	Three	Three	Two	.....	Three	Three	Two

THE SIX-CYLINDER PLEASURE CAR MODELS OFFERED FOR 1917.

Name of Car	Abbott-Detroit	Altecar	American	Six	Anderson	Apperson	Auburn	Austin	Ben-Hur
No. or Name of Model	6-44	F-17	A	51x-40	51x-40	6-17	6-44	48-66	17
Horsepower (S. A. E.)	25.35	21.60	3,000x5,000	3,250x4,500	3,500x5,000	3,500x5,250	3,125x5,000	4,500x6,000	3,875x5,250
Piston Displacement	224.0	180.3	212.0	224.0	288.6	230.1	230.1	572.0	303.0
Cylinders, Shape, Cast	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block
Who Makes Motor	Continental	Falls	Amco	Continental	Apperson	Continental	Teetor	Teetor	Buda
Location of Valves	.....	.....	.....	.....	.....	.....	.....	.....	.....
Type Camshaft Drive	.....	.....	.....	.....	.....	.....	.....	.....	.....
Type Cooling System	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lubrication System	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oil Pump	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ignition System	.....	.....	.....	.....	.....	.....	.....	.....	.....
Make and Control	.....	.....	.....	.....	.....	.....	.....	.....	.....
Method of Carburetor	.....	.....	.....	.....	.....	.....	.....	.....	.....
Method of Fuel Feed	.....	.....	.....	.....	.....	.....	.....	.....	.....
Starting System	Make. Remy	Stromberg	Alis Chalmers	Gray & Davis West.	Rayfield	Rayfield	Rayfield	Rayfield	Master
Lighting System	Make. Remy	Stromberg	Alis Chalmers	Gray & Davis West.	Rayfield	Rayfield	Rayfield	Rayfield	Master
Type of Clutch	.....	.....	.....	.....	.....	.....	.....	.....	.....
Type of Gearset	.....	.....	.....	.....	.....	.....	.....	.....	.....
Speed Ratios	.....	.....	.....	.....	.....	.....	.....	.....	.....
Drive Through	.....	.....	.....	.....	.....	.....	.....	.....	.....
Type of Rear Axle	.....	.....	.....	.....	.....	.....	.....	.....	.....
Direct Drive Ratio	4.42-1	4.42-1	4.42-1	4.42-1	4.42-1	4.42-1	4.42-1	4.42-1	4.42-1
Wheelbase	122 inches	114 inches	122 inches	120 inches	128 inches	131 inches	120 inches	142 inches	126 inches
Sizes of Tires	32x4, 35x4 1/2	32x4 F. & R.	32x4 F. & R.	33x4 F. & R.	34x4 F. & R.	35x4 1/2 F. & R.	34x4 F. & R.	34x4 1/2 F. & R.	35x4 1/2 F. & R.
Wheels (Wood or Wire)	Wood	Wood	Wood	Wood	Wood	Wood	Wood	Wood	Wire
Type of Rear Springs	.....	.....	.....	.....	.....	.....	.....	.....	.....
Drive and Control	.....	.....	.....	.....	.....	.....	.....	.....	.....
Type Gearset Bearings	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rear Axle Bearings	.....	.....	.....	.....	.....	.....	.....	.....	.....
Front Axle Bearings	.....	.....	.....	.....	.....	.....	.....	.....	.....
No. Eng. Main Bearings	Three	Three	Three	Three	Four	Three	Three	Four	Four

THE SIX-CYLINDER PLEASURE CAR MODELS OFFERED FOR 1917.

Data Regarding Prices, Seating Capacities and Body Types Are Given in the General Indexes.

Name of Car.	Halladay
No. or Name of Model.	R-3
Bore and Stroke.	3.125x5.000
Horsepower (S. A. E.).	23.44
Piston Displacement.	230.2
Cylinders, Shape, Cast.	6-L-Block
Who Makes Motor.	Rutenber
Location of Valves.	Left
Type Camshaft Drive.	Helical
Type Cooling System.	Pump
Lubrication System.	Splash
Oil Pump.	Gear
Ignition System Type.	Single
Make and Control.	West, hand
Method of Carburetor.	Stromberg
Method of Fuel Feed.	Vacuum
Starting System Make.	West.
Lighting System Make.	West.
Type of Clutch.	Disc
Type of Gearset.	S-Unit, M
Speed Ratios.	Three
Drive Through.	Spring
Type of Rear Axle.	% float.
Direct Drive Ratio.	4.62-1
Wheelbase.	121, 127 in.
Sizes of Tires.	32x4 F. & R.
Wheels (Wood or Wire).	Wood
Type of Rear Springs.	% elliptic
Drive and Control.	Left, centre
Type Gearset Bearings.	Ball
Rear Axle Bearings.	Ball
Front Axle Bearings.	Ball
No. Eng. Main Bearings.	.....

Haynes L. Six	Holler
36 and 37	186
Bore and Stroke.	3.500x5.000
Horsepower (S. A. E.).	29.40
Piston Displacement.	288.6
Cylinders, Shape, Cast.	6-L-Block
Who Makes Motor.	Haynes
Location of Valves.	Right
Type Camshaft Drive.	Helical
Type Cooling System.	Pump
Lubrication System.	Splash
Oil Pump.	Plunger
Ignition System Type.	Single
Make and Control.	Remy, hand
Method of Carburetor.	Rayfield
Method of Fuel Feed.	Vacuum
Starting System Make.	Leece-Neville
Lighting System Make.	Leece-Neville
Type of Clutch.	Disc
Type of Gearset.	S-Unit, M
Speed Ratios.	Three
Drive Through.	Spring
Type of Rear Axle.	% float.
Direct Drive Ratio.	4.42-1
Wheelbase.	121, 127 in.
Sizes of Tires.	32x4 F. & R.
Wheels (Wood or Wire).	Wood
Type of Rear Springs.	% elliptic
Drive and Control.	Left, centre
Type Gearset Bearings.	Ball
Rear Axle Bearings.	Ball
Front Axle Bearings.	Ball
No. Eng. Main Bearings.	.....

Howard	1917
36 and 37	186
Bore and Stroke.	3.500x5.250
Horsepower (S. A. E.).	29.39
Piston Displacement.	303.1
Cylinders, Shape, Cast.	6-L-Block
Who Makes Motor.	Continental
Location of Valves.	Right
Type Camshaft Drive.	Helical
Type Cooling System.	Pump
Lubrication System.	F. F. & Spl.
Oil Pump.	Plunger
Ignition System Type.	Single
Make and Control.	Delco, H. & A.
Method of Carburetor.	Rayfield
Method of Fuel Feed.	Vacuum
Starting System Make.	Delco
Lighting System Make.	Delco
Type of Clutch.	Disc
Type of Gearset.	S-Unit, M
Speed Ratios.	Three
Drive Through.	Spring
Type of Rear Axle.	% float.
Direct Drive Ratio.	4.09-1
Wheelbase.	125 1/4 inches
Sizes of Tires.	32x4 F. & R.
Wheels (Wood or Wire).	Wood
Type of Rear Springs.	% elliptic
Drive and Control.	Left, centre
Type Gearset Bearings.	Roller
Rear Axle Bearings.	Roller
Front Axle Bearings.	Roller
No. Eng. Main Bearings.	.....

Jeffery	6
36 and 37	186
Bore and Stroke.	3.500x4.625
Horsepower (S. A. E.).	29.40
Piston Displacement.	287.0
Cylinders, Shape, Cast.	6-L-Block
Who Makes Motor.	Nash
Location of Valves.	Right
Type Camshaft Drive.	Chain
Type Cooling System.	Pump
Lubrication System.	F. F. & Spl.
Oil Pump.	Plunger
Ignition System Type.	Single
Make and Control.	Auto-Lite, H.
Method of Carburetor.	Stromberg
Method of Fuel Feed.	Vacuum
Starting System Make.	Auto-Lite
Lighting System Make.	Auto-Lite
Type of Clutch.	Disc
Type of Gearset.	S-Unit, M
Speed Ratios.	Three
Drive Through.	Spring
Type of Rear Axle.	% float.
Direct Drive Ratio.	5.00-1
Wheelbase.	123 inches
Sizes of Tires.	32x4 F. & R.
Wheels (Wood or Wire).	Wood
Type of Rear Springs.	% elliptic
Drive and Control.	Left, centre
Type Gearset Bearings.	Roller
Rear Axle Bearings.	Roller
Front Axle Bearings.	Roller
No. Eng. Main Bearings.	.....

Jordan	60
36 and 37	186
Bore and Stroke.	3.500x5.250
Horsepower (S. A. E.).	29.40
Piston Displacement.	303.0
Cylinders, Shape, Cast.	6-L-Block
Who Makes Motor.	Continental
Location of Valves.	Right
Type Camshaft Drive.	Helical
Type Cooling System.	Pump
Lubrication System.	F. F. & Spl.
Oil Pump.	Plunger
Ignition System Type.	Single
Make and Control.	Boch
Method of Carburetor.	Stromberg
Method of Fuel Feed.	Vacuum
Starting System Make.	Bijur
Lighting System Make.	Bijur
Type of Clutch.	Disc
Type of Gearset.	S-Unit, M
Speed Ratios.	Three
Drive Through.	Spring
Type of Rear Axle.	% float.
Direct Drive Ratio.	4.35-1
Wheelbase.	137 inches
Sizes of Tires.	32x4 F. & R.
Wheels (Wood or Wire).	Wood
Type of Rear Springs.	% elliptic
Drive and Control.	Left, centre
Type Gearset Bearings.	Roller
Rear Axle Bearings.	Roller
Front Axle Bearings.	Roller
No. Eng. Main Bearings.	.....

Kissel	6-43
36 and 37	186
Bore and Stroke.	3.625x5.500
Horsepower (S. A. E.).	31.54
Piston Displacement.	340.3
Cylinders, Shape, Cast.	6-L-Block
Who Makes Motor.	Kissel
Location of Valves.	Right
Type Camshaft Drive.	Helical
Type Cooling System.	Pump
Lubrication System.	Splash
Oil Pump.	Gear
Ignition System Type.	Single
Make and Control.	Elise, hand
Method of Carburetor.	Stromberg
Method of Fuel Feed.	Vacuum
Starting System Make.	Kissel
Lighting System Make.	West.
Type of Clutch.	Disc
Type of Gearset.	S-Unit, M
Speed Ratios.	Three
Drive Through.	Spring
Type of Rear Axle.	% float.
Direct Drive Ratio.	4.58-1
Wheelbase.	117 inches
Sizes of Tires.	32x4 F. & R.
Wheels (Wood or Wire).	Wood
Type of Rear Springs.	% elliptic
Drive and Control.	Left, centre
Type Gearset Bearings.	Ball
Rear Axle Bearings.	Roller
Front Axle Bearings.	Roller
No. Eng. Main Bearings.	.....

Kline Kar	6-38
36 and 37	186
Bore and Stroke.	3.250x4.500
Horsepower (S. A. E.).	26.36
Piston Displacement.	224.0
Cylinders, Shape, Cast.	6-L-Block
Who Makes Motor.	Continental
Location of Valves.	Right
Type Camshaft Drive.	Helical
Type Cooling System.	Pump
Lubrication System.	F. F. & Spl.
Oil Pump.	Plunger
Ignition System Type.	Single
Make and Control.	West, hand
Method of Carburetor.	Rayfield
Method of Fuel Feed.	Vacuum
Starting System Make.	West.
Lighting System Make.	West.
Type of Clutch.	Disc
Type of Gearset.	S-Unit, M
Speed Ratios.	Three
Drive Through.	Spring
Type of Rear Axle.	% float.
Direct Drive Ratio.	4.50-1
Wheelbase.	120 inches
Sizes of Tires.	32x4 F. & R.
Wheels (Wood or Wire).	Wood
Type of Rear Springs.	% elliptic
Drive and Control.	Left, centre
Type Gearset Bearings.	Ball
Rear Axle Bearings.	Roller
Front Axle Bearings.	Ball
No. Eng. Main Bearings.	.....

Lexington	6-P
36 and 37	186
Bore and Stroke.	4.125x5.250
Horsepower (S. A. E.).	40.80
Piston Displacement.	421.0
Cylinders, Shape, Cast.	6-L-Block
Who Makes Motor.	Continental
Location of Valves.	Right
Type Camshaft Drive.	Helical
Type Cooling System.	Pump
Lubrication System.	F. F. & Spl.
Oil Pump.	Plunger
Ignition System Type.	Double
Make and Control.	West, At. Kt.
Method of Carburetor.	Stromberg
Method of Fuel Feed.	Vacuum
Starting System Make.	West.
Lighting System Make.	West.
Type of Clutch.	Cone
Type of Gearset.	S-Unit, M
Speed Ratios.	Three
Drive Through.	Spring
Type of Rear Axle.	% float.
Direct Drive Ratio.	4.08-1
Wheelbase.	144 inches
Sizes of Tires.	32x4 F. & R.
Wheels (Wood or Wire).	Wood
Type of Rear Springs.	% elliptic
Drive and Control.	Left, centre
Type Gearset Bearings.	Ball
Rear Axle Bearings.	Roller
Front Axle Bearings.	Roller
No. Eng. Main Bearings.	.....

Liberty	10-A
36 and 37	186
Bore and Stroke.	3.125x4.500
Horsepower (S. A. E.).	28.40
Piston Displacement.	207.1
Cylinders, Shape, Cast.	6-L-Block
Who Makes Motor.	Continental
Location of Valves.	Right
Type Camshaft Drive.	Helical
Type Cooling System.	Pump
Lubrication System.	F. F. & Spl.
Oil Pump.	Plunger
Ignition System Type.	Single
Make and Control.	Delco, hand
Method of Carburetor.	Rayfield
Method of Fuel Feed.	Vacuum
Starting System Make.	Delco
Lighting System Make.	Delco
Type of Clutch.	Disc
Type of Gearset.	S-Unit, M
Speed Ratios.	Three
Drive Through.	Spring
Type of Rear Axle.	% float.
Direct Drive Ratio.	4.75-1
Wheelbase.	115 inches
Sizes of Tires.	32x4 F. & R.
Wheels (Wood or Wire).	Wood
Type of Rear Springs.	% elliptic
Drive and Control.	Left, centre
Type Gearset Bearings.	Ball
Rear Axle Bearings.	Roller
Front Axle Bearings.	Roller
No. Eng. Main Bearings.	.....

Locomobile	M-7 4697
36 and 37	186
Bore and Stroke.	4.500x5.500
Horsepower (S. A. E.).	48.60
Piston Displacement.	525.0
Cylinders, Shape, Cast.	6-L-Block
Who Makes Motor.	Locomobile
Location of Valves.	Right
Type Camshaft Drive.	Helical
Type Cooling System.	Pump
Lubrication System.	F. F. & Spl.
Oil Pump.	Gear
Ignition System Type.	Double
Make and Control.	Elise, hand
Method of Carburetor.	Loco. B. & B.
Method of Fuel Feed.	Pressure
Starting System Make.	West.
Lighting System Make.	West.
Type of Clutch.	Disc
Type of Gearset.	Selec.-Amld.
Speed Ratios.	Four
Drive Through.	Radius rods
Type of Rear Axle.	% float.
Direct Drive Ratio.	3.85-1
Wheelbase.	142 inches
Sizes of Tires.	32x4 F. & R.
Wheels (Wood or Wire).	Wood
Type of Rear Springs.	% elliptic
Drive and Control.	Left, centre
Type Gearset Bearings.	Ball
Rear Axle Bearings.	Roller
Front Axle Bearings.	Roller
No. Eng. Main Bearings.	.....

Lozier	83
36 and 37	186
Bore and Stroke.	3.875x5.000
Horsepower (S. A. E.).	36.00
Piston Displacement.	424.5
Cylinders, Shape, Cast.	6-L-Block
Who Makes Motor.	Lozier
Location of Valves.	Right
Type Camshaft Drive.	Chain
Type Cooling System.	Pump
Lubrication System.	F. F. & Spl.
Oil Pump.	Gear
Ignition System Type.	Single
Make and Control.	Elise, hand
Method of Carburetor.	Rayfield
Method of Fuel Feed.	Pressure
Starting System Make.	Gray & Davis
Lighting System Make.	Gray & Davis
Type of Clutch.	Disc
Type of Gearset.	S-Unit, M
Speed Ratios.	Three
Drive Through.	Radius rods
Type of Rear Axle.	% float.
Direct Drive Ratio.	3.93-1
Wheelbase.	132 inches
Sizes of Tires.	32x4 F. & R.
Wheels (Wood or Wire).	Wood
Type of Rear Springs.	% elliptic
Drive and Control.	Left, centre
Type Gearset Bearings.	Ball
Rear Axle Bearings.	Roller
Front Axle Bearings.	Roller
No. Eng. Main Bearings.	.....

Madison	A and B
36 and 37	186
Bore and Stroke.	4.000x5.000
Horsepower (S. A. E.).	23.44
Piston Displacement.	230.1
Cylinders, Shape, Cast.	6-L-Block
Who Makes Motor.	Rutenber
Location of Valves.	Right
Type Camshaft Drive.	Helical
Type Cooling System.	Pump
Lubrication System.	F. F. & Spl.
Oil Pump.	Plunger
Ignition System Type.	Double
Make and Control.	West, B, hand
Method of Carburetor.	Stromberg
Method of Fuel Feed.	Vacuum
Starting System Make.	West.
Lighting System Make.	West.
Type of Clutch.	Disc
Type of Gearset.	S-Unit, M
Speed Ratios.	Three
Drive Through.	Torque arm
Type of Rear Axle.	% float.
Direct Drive Ratio.	4.64-1
Wheelbase.	115 and 124 in.
Sizes of Tires.	32x4 F. & R.
Wheels (Wood or Wire).	Wood
Type of Rear Springs.	% elliptic
Drive and Control.	Left, centre
Type Gearset Bearings.	Ball
Rear Axle Bearings.	Roller
Front Axle Bearings.	Roller
No. Eng. Main Bearings.	.....

Name of Car	Madison	Marion-Handy	Marion-Handy	Marmon	M. H. C.	Mitchell	Mitchell Six	Monitor	Moon	Moon
No. or Name of Model	C	6-40 B	34	34	Six	D-40	C-42	N. & O.	6-43	6-43
Bore and Stroke	3.125x5.000	3.500x5.250	3.750x5.125	3.750x5.125	3.250x4.500	3.250x5.000	3.250x5.000	3.250x4.500	3.250x4.500	3.250x4.500
Horsepower (S. A. E.)	23.44	29.40	33.75	33.75	26.35	26.35	29.40	23.44	25.35	29.40
Piston Displacement	230.1	300.1	339.63	339.63	224.0	248.8	288.6	230.1	224.4	303.1
Cylinders, Shape, Cast	6-L-Block	6-L-Block	Marmon	Marmon	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block
Who Makes Motor	Rutenber	Right	Head	Head	Right	Left	Mitchell	Continental	Continental	Continental
Location of Valves	Right	Helical	Helical	Helical	Gear	Helical	Left	Helical	Right	Right
Type Camshaft Drive	Helical	Pump	Pump	Pump	F. F. & Spl.	Pump	Helical	Pump	Helical	Helical
Type Cooling System	Pump	F. F. & Spl.	Force F.	Force F.	F. F. & Spl.	Splash	Splash	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.
Lubrication System	Splash	Plunger	Gear	Gear	Gear	Plunger	Plunger	Plunger	Plunger	Plunger
Oil Pump	Plunger	Single	Single	Single	Single	Single	Single	Single	Single	Single
Ignition System Type	Dual	West, hand	Bosch, hand	Bosch, hand	West, hand	Conn., hand	Conn., hand	Heinze, hand	Delco, auto.	Delco, auto.
Make and Control	Remy, hand	West, hand	Stromberg	Stromberg	Stromberg	Rayfield	Rayfield	Stromberg	Rayfield	Rayfield
Make of Carburetor	Vacuum	Vacuum	Gravity	Gravity	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum
Method of Fuel Feed	Vacuum	West	Bosch	Bosch	West	West	West	Heinze	Delco	Delco
Starting System Make	Remy	West	West	West	West	Spittdorf	West	Heinze	Delco	Delco
Lighting System Make	Remy	Disc	Cone	Cone	Disc	Cone	Cone	Disc	Disc	Disc
Type of Clutch	Disc	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M
Type of Gearset	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
Speed Ratios	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
Drive Through	Springs	Springs	Torque tube	Torque tube	Springs	Springs	Springs	Springs	Springs	Springs
Type of Rear Axle	Full float	Full float	% float	% float	Full float	Full float	Full float	% float	% float	% float
Direct Drive Ratio	4.42-1	4.07-1	3.69-1	3.69-1	5.00-1	4.12-1	4.12-1	4.00-1	4.75-1	4.50-1
Wheelbase	120 inches	125 inches	136 inches	136 inches	148 inches	120 inches	127 inches	115 inches	118 inches	125 inches
Sizes of Tires	34x4 F. & R.	35x4 1/2 F. & R.	34x4 1/2 F. & R.	34x4 1/2 F. & R.	34x4 1/2 F. & R.	34x4 1/2 F. & R.	34x4 1/2 F. & R.	33x4 F. & R.	33x4 F. & R.	35x4 1/2 F. & R.
Wheels (Wood or Wire)	Wood	Wood	Wire	Wire	Wood	Wood	Wood	Wood	Wood	Wood
Type of Rear Springs	% elliptic	% elliptic	Transverse	Transverse	% elliptic	Cantilever	Cantilever	% elliptic	% elliptic	% elliptic
Drive and Control	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre
Type Gearset Bearings	Ball	Ball	B. & R.	B. & R.	Roller	B. & R.	B. & R.	Ball	Ball	Ball
Rear Axle Bearings	Ball	Roller	B. & R.	B. & R.	Roller	Roller	Roller	Ball	Ball	Roller
Front Axle Bearings	Ball	Ball	Roller	Roller	Roller	Roller	Roller	Ball	Ball	Roller
No. Eng. Main Bearings	Three	Three	Four	Four	Three	Three	Three	Three	Three	Three

Name of Car	National	Overland	Ogden	Oakland	Overland	Ogden	Oakland	Overland	Ogden	Oakland
No. or Name of Model	Highway C	85-6	1917	24	85-6	1917	24	85-6	1917	24
Bore and Stroke	3.500x5.250	3.250x4.500	3.750x5.500	3.250x4.500	3.250x4.500	3.750x5.500	3.250x4.500	3.250x4.500	3.750x5.500	3.250x4.500
Horsepower (S. A. E.)	29.40	26.35	33.75	26.35	26.35	33.75	26.35	26.35	33.75	26.35
Piston Displacement	303.1	177.0	364.3	177.0	177.0	364.3	177.0	177.0	364.3	177.0
Cylinders, Shape, Cast	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block
Who Makes Motor	National	Continental	Continental	Continental	Continental	Continental	Continental	Continental	Continental	Continental
Location of Valves	Right	Helical	Helical	Helical	Helical	Helical	Helical	Helical	Helical	Helical
Type Camshaft Drive	Helical	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump
Type Cooling System	Pump	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.
Lubrication System	F. F. & Spl.	Gear	Gear	Gear	Gear	Gear	Gear	Gear	Gear	Gear
Oil Pump	Gear	Plunger	Plunger	Plunger	Plunger	Plunger	Plunger	Plunger	Plunger	Plunger
Ignition System Type	Single	Single	Single	Single	Single	Single	Single	Single	Single	Single
Make and Control	Spit, hand	Conn., hand	Conn., hand	Conn., hand	Conn., hand	Conn., hand	Conn., hand	Conn., hand	Conn., hand	Conn., hand
Make of Carburetor	Rayfield	Tillotson	Tillotson	Tillotson	Tillotson	Tillotson	Tillotson	Tillotson	Tillotson	Tillotson
Method of Fuel Feed	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum
Starting System Make	West	West	West	West	West	West	West	West	West	West
Lighting System Make	West	West	West	West	West	West	West	West	West	West
Type of Clutch	Cone	Cone	Cone	Cone	Cone	Cone	Cone	Cone	Cone	Cone
Type of Gearset	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M
Speed Ratios	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
Drive Through	Springs	Torque rod	Torque rod	Torque rod	Torque rod	Torque rod	Torque rod	Torque rod	Torque rod	Torque rod
Type of Rear Axle	Full float	% float	% float	% float	% float	% float	% float	% float	% float	% float
Direct Drive Ratio	4.42-1	4.50-1	4.50-1	4.50-1	4.50-1	4.50-1	4.50-1	4.50-1	4.50-1	4.50-1
Wheelbase	128 inches	112 inches	132 inches	132 inches	116 inches	132 inches	132 inches	116 inches	132 inches	132 inches
Sizes of Tires	34x4 F. & R.	34x4 F. & R.	34x4 F. & R.	34x4 F. & R.	34x4 F. & R.	34x4 F. & R.	34x4 F. & R.	34x4 F. & R.	34x4 F. & R.	34x4 F. & R.
Wheels (Wood or Wire)	Wood	Wood	Wood	Wood	Wood	Wood	Wood	Wood	Wood	Wood
Type of Rear Springs	Cantilever	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic	% elliptic
Drive and Control	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre
Type Gearset Bearings	Ball	B. & R.	B. & R.	B. & R.	B. & R.	B. & R.	B. & R.	B. & R.	B. & R.	B. & R.
Rear Axle Bearings	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
Front Axle Bearings	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
No. Eng. Main Bearings	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three

THE SIX-CYLINDER PLEASURE CAR MODELS OFFERED FOR 1917.

Data Regarding Prices, Seating Capacities and Body Types Are Given in the General Indexes.

Name of Car	Pierce-Arrow	Pilot	Premier	Reo	Roamer	Saxon	Simplex	Singer	S. S. E.
No. or Name of Model	48-B-4	6-45	GB	M	Roamer	8-4	5	17	1
Horse and Stroke	4,500x5.500	3,125x5.000	3,375x5.500	3,562x5.125	3,125x5.250	2,875x4.500	4,375x6.250	4,000x5.500	3,552x5.000
Horsepower (S. A. E.)	43.60	27.30	37.30	30.46	23.43	19.84	45.94	38.40	29.39
Piston Displacement	524.8	230.1	295.22	306.6	230.2	175.3	563.7	414.7	300.0
Cylinders, Shape, Cast	6-T-2s	6-L-Block	6-L-Block	6-L-3s	6-L-Block	6-L-Block	6-L-3s	6-L-2s	6-L-Block
Who Makes Motor	Pierce-Arrow	Tetor	Premier	Reo	Rutenber	Continental	Simplex	H-Spill	S. S. E.
Location of Valves	R. & L.	Right	Head	R. & H.	Right	Right	Left	R. & L.	Head
Type Camshaft Drive	Helical	Helical	Helical	Helical	Helical	Helical	Chain	Helical	.....
Type Cooling System	Pump	Pump	Pump	Pump	Pump	Ther-Syp.	Pump	Pump	Pump
Lubrication System	Force F.	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	Splash	Force F.	Force F.	Force F.
Oil Pump	Gear	Plunger	Gear	Gear	Gear	Plunger	Gear	Gear	.....
Ignition System Type	Double	Single	Single	Single	Single	Single	Dual	Single	Single
Make and Control	Bosch, hand	Delco, H. & A.	Delco, auto.	Remy, hand	Bosch, hand	Remy, hand	Eise, hand	Bosch, hand	.....
Make of Carburetor	Pierce-Arrow	Johnson	Johnson	Rayfield	Stromberg	Ray, or Strom.	Newcomb	Rayfield	Zenith
Method of Fuel Feed	Pressure	Vacuum	Vacuum	Vacuum	Vacuum	Gravity	Pressure	Vacuum	Pressure
Starting System Make	West.	Delco	Delco	Remy	Bijur	Wagner	Bosch	West.	Delco, U. S. L.
Lighting System Make	West.	Delco	Delco	Remy	Bijur	Wagner	Bosch	West.	Delco
Type of Clutch	Cone	Disc	Disc	Disc	Disc	Disc	Disc	Disc	Disc
Type of Gearset	Select.-Aml.	S-Unit, M	S-Unit, M	Select.-Aml.	S-Unit, M	S-Unit, X	Select.-Aml.	S-Unit, M	S-Unit, M
Speed Ratios	Four	Three	Three	Three	Three	Three	Four	Four	Three
Drive Through	Springs	Springs	Springs	Springs	Springs	Torque rod	Springs	Springs	Springs
Type of Rear Axle	1/2 float.	1/2 float.	1/2 float.	1/2 float.	1/2 float.	1/2 float.	1/2 float.	1/2 float.	Full float.
Direct Drive Ratio	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Wheelbase	142 inches	119 inches	126 1/2 inches	126 inches	126 inches	112 inches	143.5 inches	136 inches	121, 130 in.
Sizes of Tires	37x5 F. & R.	32x4 F. & R.	35x4 1/2 F. & R.	32x4 1/2 F. & R.	32x4 1/2 F. & R.	32x3 1/2 F. & R.	32x4 1/2 F. & R.	32x4 F. & R.	Optional
Wheels (Wood or Wire)	Wood	Wood	Wood	Wire	Wire	Wood	Wood	Optional	Optional
Type of Rear Springs	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	Optional
Drive and Control	Right	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre
Type Gearset Bearings	Ball	Ball	Ball	Roller	Roller	Plain	Ball	Ball	Ball
Rear Axle Bearings	B. & R.	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
Front Axle Bearings	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
No. Eng. Main Bearings	Seven	Three	Three	Three	Three	Three	Three	Three	Seven

Name of Car	Studebaker	Sun 'Light Six'	Velle-Biltwell	Westcott	Willys-Six	Winton
No. or Name of Model	6-50	17	25	17	88-6	48
Horse and Stroke	3,875x5.000	3,125x5.000	3,250x4.500	3,500x5.250	3,500x5.250	4,500x5.500
Horsepower (S. A. E.)	36.04	23.40	25.35	29.40	29.40	33.75
Piston Displacement	353.8	230.0	224.0	303.0	303.0	534.8
Cylinders, Shape, Cast	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-Block	6-L-2s
Who Makes Motor	Studebaker	Sun	Continental	Continental	Continental	Winton
Location of Valves	Left	Right	Right	Right	Right	Right
Type Camshaft Drive	Helical	Helical	Helical	Helical	Helical	Chain
Type Cooling System	Pump	Pump	Pump	Pump	Pump	Pump
Lubrication System	Splash	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	F. F. & Spl.	Force F.
Oil Pump	Gear	Plunger	Plunger	Plunger	Plunger	Plunger
Ignition System Type	Single	Single	Dual	Dual	Single	Duplex
Make and Control	Remy, hand	Remy, hand	Remy, auto.	Delco, H. & A.	Bosch, hand	Bosch, hand
Make of Carburetor	Schebler	Rayfield	Stromberg	Rayfield	Rayfield	Rayfield
Method of Fuel Feed	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum
Starting System Make	Stud.-Wagner	Remy	Remy	Delco	Auto-Lite	Bijur
Lighting System Make	Stud.-Wagner	Remy	Remy	Delco	Auto-Lite	Bijur
Type of Clutch	Cone	Disc	Disc	Disc	Cone	Disc
Type of Gearset	S-Unit, X	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, X	S-Unit, M
Speed Ratios	Three	Three	Three	Three	Three	Four
Drive Through	Radius rods	Springs	Springs	Springs	Torque rod	Springs
Type of Rear Axle	Full float.	1/2 float.	1/2 float.	1/2 float.	Full float.	Full float.
Direct Drive Ratio	122 inches	116 inches	115 inches	124 inches	125 inches	138 inches
Wheelbase	37.0-1	4.75-1	4.33-1	4.08-1	4.00-1	4.46-1
Sizes of Tires	35x4 1/2 F. & R.	32x4 F. & R.	32x4 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	36x4 1/2 F. & R.
Wheels (Wood or Wire)	Wood	Wood	Optional	Optional	Wood	Optional
Type of Rear Springs	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Drive and Control	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre
Type Gearset Bearings	Roller	Ball	Ball	Ball	Ball	B. & R.
Rear Axle Bearings	Roller	Roller	Roller	Roller	Roller	Roller
Front Axle Bearings	Roller	Roller	Roller	Roller	Roller	Roller
No. Eng. Main Bearings	Four	Three	Three	Three	Three	Four

SPECIFICATIONS OF 1917's EIGHT-CYLINDER PLEASURE CARS.

Data Regarding Prices, Seating Capacities and Body Types Are Given in the General Indexes.

Name of Car	Apperson	Briscoe	Cadillac	Chevrolet	Cole	Cunningham	Danals	Drummond	Ghent	Holler
No. or Name of Model	8-17	8-35	55	D2, D5	860-1-3-3-5	V	A	17	Eight 40	178
Bore and Stroke	3.000x3.500	3.000x3.500	3.125x5.125	3.375x4.000	3.500x4.250	3.750x5.000	3.250x5.000	3.000x5.000	2.625x4.000	3.000x4.250
Horsepower (S. A. E.)	32.80	32.80	31.25	36.45	39.20	45.00	33.80	38.50	22.05	28.50
Piston Displacement	330.6	197.9	314.4	.....	346.3	441.8	331.8	384.0	173.3	240.3
Cylinders, Shape, Cast	8-V-4s	8-I-Block	8-V-Block	8-I-4s	8-L-4s	8-L-4s	8-L-4s	8-L-Block	8-V-Block	8-V-Block
Who Makes Motor	Apperson	Ferro	Cadillac	Chevrolet	Northway	Cunningham	H-Spill.	H-Spill.	Abie	Holler
Location of Valves	Inside	Head	Inside	Head	Inside	Left	Inside	Right	Head	Inside
Type Camshaft Drive	Helical	Helical	Helical	Helical	Helical	Pump	Pump	Helical	Helical	Helical
Type Cooling System	Ther.-Syp.	Ther.-Syp.	Pumps	Pump	Pump	Force F.	Force F.	Force F.	Ther.-Syp.	Ther.-Syp.
Lubrication System	Force F.	F. F. & Spl.	Gear	Plunger	Gear	Gear	Gear	Force F.	Force F.	Splash
Oil Pump	.....	Gear	Single	Single	Single	Single	Single	Gear	.....	.....
Ignition System Type	Dual	Single	Delco, H. & A. Remy	Delco, H. & A. Remy	Delco, H. & A. Remy	Delco, H. & A. Remy	Delco, H. & A. Remy	Single	Single	Single
Make and Control	Remy, hand	Remy, hand	Cadillac	Cadillac	Stromberg	Stromberg	Stromberg	West	G. & D., hand	Stewart
Make of Carburetor	Rayfield	Zenith	Pressure	.....	Vacuum	Vacuum	Vacuum	Vacuum	Carter	Vacuum
Method of Fuel Feed	Vacuum	Gravity	Delco	Auto-Lite	Delco	Delco	Delco	West	Gray & Davis	Apeico
Starting System Make	Bijur	Apeico	Delco	Auto-Lite	Delco	Delco	Delco	West	Gray & Davis	Apeico
Lighting System Make	Bijur	Apeico	Delco	Auto-Lite	Delco	Delco	Delco	West	Gray & Davis	Apeico
Type of Clutch	Disc	Cone	Disc	Cone	Cone	Disc	Disc	Disc	Disc	Cone
Type of Gearset	Disc	Disc	Disc	Disc	Disc	Disc	Disc	Disc	Disc	Cone
Speed Ratios	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Drive Through	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Drive of Rear Axle	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Type of Rear Axle	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Direct Drive Ratio	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wheelbase	128 inches	114 inches	126, 132 in.	130 inches	137 inches	132 inches	137 inches	130 inches	130 inches	116 inches
Sizes of Tires	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.
Wheels (Wood or Wire)	Wood	Wood	Platform	Wood	Wood	Optional	Wood	Wood	Steel	Wood
Type of Rear Springs	% elliptic	Cantilever	Platform	Cantilever	% elliptic	% elliptic	% elliptic	Cantilever	% elliptic	Cantilever
Drive and Control	Left, centre	Opt., centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre
Type Gearset Bearings	Roller	.....	Ball	Ball	B. & R.	B. & R.	B. & R.	Ball	Ball	Ball
Rear Axle Bearings	Roller	B. & R.	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
Front Axle Bearings	Roller	Ball	Roller	Ball	Roller	Ball	Roller	Roller	Ball	Ball
No. Eng. Main Bearings	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three

Name of Car	H-Laughlin	S Jackson	King	Murray	Oakland	Oldsmobile	Peerless	Pilgrim	Ross	Scripps-Booth
No. or Name of Model	D	249, 350	EE	70 T	50	45	56	.....	C	D
Bore and Stroke	2.250x3.750	3.000x3.500	3.000x5.000	3.250x5.000	3.500x4.500	2.875x4.750	3.250x5.000	3.250x4.000	3.250x5.000	2.625x3.375
Horsepower (S. A. E.)	16.20	32.80	28.80	32.80	32.80	26.40	33.80	32.80	33.80	22.05
Piston Displacement	119.28	198.0	282.6	331.8	346.5	246.7	331.8	266.5	331.8	162.2
Cylinders, Shape, Cast	8-L-Block	8-V-Block	King	8-V-Block	8-V-4s	8-L-4s	8-L-4s	8-V-Block	8-V-Block	8-I-2s
Who Makes Motor	H-Laughlin	Ferro	King	H-Spill.	Northway	Oldsmobile	Peerless	.....	H-Spill.	Ferro
Location of Valves	Right	Head	Inside	Inside	Inside	Inside	Inside	Head	Inside	Head
Type Camshaft Drive	.....	Helical	Chain	Gear	Helical	Helical	Spur	Gear	Gear	Helical
Type Cooling System	Ther.-Syp.	Ther.-Syp.	Ther.-Syp.	Pump	Pump	Pump	Pump	Ther.-Syp.	Pump	Ther.-Syp.
Lubrication System	Splash	Force F.	Force F.	F. F. & Spl.	F. F. & Spl.	Force F.	Force F.	Force F.	Force F.	Force F.
Oil Pump	.....	Gear	Gear	.....	Gear	Gear	Gear	.....	Gear	Gear
Ignition System Type	Single	Single	Single	Single	Dual	Single	Dual	Single	Single	Single
Make and Control	At. Kt., auto.	Remy, hand	At. Kt., H. & A. Remy	Delco, H. & A. Remy	Delco, H. & A. Remy	Delco, H. & A. Remy	Delco, H. & A. Remy	At. Kt., H. & A. Remy	At. Kt., H. & A. Remy	At. Kt., H. & A. Remy
Make of Carburetor	Vacuum	Zenith	Ball & Ball	Stromberg	Stromberg	Vacuum	Vacuum	Ball & Ball	Zenith	Zenith
Method of Fuel Feed	Allis Chalmers	Auto-Lite	Vacuum	Vacuum	Vacuum	Delco	Delco	Gray & Davis	Ward-Leonard	Ward-Leonard
Starting System Make	Allis Chalmers	Auto-Lite	Ward-Leonard	Ward-Leonard	Delco	Delco	Delco	Gray & Davis	Ward-Leonard	Ward-Leonard
Lighting System Make	Allis Chalmers	Auto-Lite	Ward-Leonard	Ward-Leonard	Delco	Delco	Delco	Gray & Davis	Ward-Leonard	Ward-Leonard
Type of Clutch	Disc	Disc	Disc	Disc	Cone	Cone	Disc	Disc	Disc	Disc
Type of Gearset	Disc	Disc	Disc	Disc	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M
Speed Ratios	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Drive Through	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Drive of Rear Axle	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Direct Drive Ratio	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wheelbase	112 inches	118, 112 in.	120 inches	128 inches	127 inches	120 inches	135 inches	132 inches	130 inches	120 inches
Sizes of Tires	30x3 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.	35x4 1/2 F. & R.
Wheels (Wood or Wire)	Wire	Optional	Wood	Wood	Wood	Wood	Wood	Wire	Wood	Wire
Type of Rear Springs	Cantilever	Elliptic	Cantilever	% elliptic	% elliptic	% elliptic	Platform	Cantilever	% elliptic	Cantilever
Drive and Control	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre	Left, centre
Type Gearset Bearings	Ball	Roller	Roller	Roller	Roller	Roller	Roller	Ball	Ball	Ball
Rear Axle Bearings	Ball	Roller	Roller	Roller	Roller	Roller	Roller	Ball	Ball	Ball
Front Axle Bearings	Ball	Ball	Ball	Ball	Ball	Roller	Roller	Ball	Ball	Ball
No. Eng. Main Bearings	.....	.....	Three	.....	Three	Two	.....	Three	Three	Two

THE 1917 TWELVE-CYLINDER GASOLINE MODELS.

Data Regarding Prices, Seating Capacities and Body Types Are Given in the General Indexes.

Name of Car.....	Standard 8	Stearns-Knight	Yale Eight	Austin	Eager
No. or Name of Model...	F	33	K	Highway King	Twin Unit 12
Bore and Stroke.....	3.250x5.000	3.250x5.000	3.125x4.500	2.875x5.000	2.687x3.500
Horsepower (S. A. E.)...	33.80	33.80	31.25	39.60	34.20
Piston Displacement....	531.8	531.8	276.0	389.6	227.3
Cylinders, Shape, Cast..	8-V-4s	8-V-Block	8-V-4s	12-V-3s	12-V-6s
Who Makes Motor.....	H-Splll	Stearns	Massnick	Weldely	Enger
Location of Valves.....	Inside	Sleeve	Inside	Heads	Heads
Type Camshaft Drive....	Helical	Gear	Helical	Helical	Chain
Type Cooling System....	Pump	Ther.-Sysp.	Ther.-Sysp.	Pump	Ther.-Sysp.
Lubrication System.....	Force F.	F. F. & Spl.	F. F. & Spl.	Force F.	F. F. & Spl.
Oil Pump.....	Gear	Gear	Gear	Gear	Gear
Ignition System Type...	Single	Single	Single	Single	Single
Make and Control.....	Splittorf, hand	Remy, hand	Remy, hand	Delco, hand	Remy, hand
Make of Carburetor.....	Zenith	Rayfield	Zenith	Stromberg	Stromberg
Method of Fuel Feed....	Vacuum	Vacuum	Vacuum	Vacuum	Gravity
Starting System Make...	Apelco	West.	Disco	Delco	West.
Lighting System Make...	Apelco	West.	Disco	Delco	West.
Type of Clutch.....	Disc	Disc	Disc	Disc	Disc
Type of Gearset.....	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M
Speed Ratios.....	Three	Three	Three	6, 2 Reverse'	Three
Drive Through.....	Springs	Springs	Springs	Springs	Springs
Type of Rear Axle.....	1/2 float.	1/2 float.	1/2 float.	Full float.	Full float.
Direct Drive Ratio.....	4.45-1	4.75-1	4.41-1	5.25-1	4.75-1
Wheelbase.....	127 inches	121 inches	126 inches	142 inches	116 inches
Sizes of Tires.....	35x4 1/2 F. & R.	35x4 1/2 F. & R.	34x4 F. & R.	34x4 1/2 F. & R.	32x4 F. & R.
Wheels (Wood or Wire)	Wood	Wood	Wood	Wood	Wood
Type of Rear Springs...	1/2 elliptic	Cantilever	1/2 elliptic	Double cantl.	Cantilever
Drive and Control.....	Left, centre	Left	Left, centre	Left, centre	Left, centre
Type Gearset Bearings...	B. & R.	B. & R.	Ball	Ball	Ball
Rear Axle Bearings.....	Roller	B. & R.	Roller	Roller	B. & R.
No. Eng. Main Bearings	Three	Three	Two	Four	Three

Name of Car.....	H. A. L. 12	Haynes L 12	National	Packard	Pathfinder
No. or Name of Model...	21-A	40-41	Highway 12	2-25, 2-35	La Salle
Bore and Stroke.....	2.875x5.000	2.750x5.000	2.875x4.750	3.000x5.000	2.875x5.000
Horsepower (S. A. E.)...	39.60	36.30	39.70	43.20	39.68
Piston Displacement....	389.0	356.3	370.0	424.1	389.6
Cylinders, Shape, Cast..	12-V-3s	12-V-6s	12-V-6s	12-V-6s	12-V-3s
Who Makes Motor.....	Weldely	Haynes	National	Packard	Pathfinder
Location of Valves.....	Heads	Heads	Outside	Inside	Heads
Type Camshaft Drive....	Helical	Chain	Helical	Chain	Spur
Type Cooling System....	Pump	Pump	Pump	Pump	Pump
Lubrication System.....	Force F.	Force F.	Force F.	Force F.	Force F.
Oil Pump.....	Plunger	Gear	Gear	Gear	Plunger
Ignition System Type...	Single	Single	Single	Single	Single
Make and Control.....	Remy, hand	Delco, H. & A.	Delco, hand	D.-Bijur, H. & A.	Delco, hand
Make of Carburetor.....	Stromberg	Rayfield	Rayfield	Packard	Stromberg
Method of Fuel Feed....	Gravity	Vacuum	Vacuum	Pressure	Vacuum
Starting System Make...	West.	Leece-Neville	Bijur	Bijur	Delco
Lighting System Make...	West.	Leece-Neville	Bijur	Bijur	Delco
Type of Clutch.....	Disc	Disc	Cone	Disc	Disc
Type of Gearset.....	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M	S-Unit, M
Speed Ratios.....	Three	Three	Three	Three	Three
Drive Through.....	Springs	Springs	Springs	Springs	Springs
Type of Rear Axle.....	Full float.	1/2 float.	Full float.	1/2 float.	Full float.
Direct Drive Ratio.....	4.46-1	4.42-1	4.58-1	4.36-1	4.30-1
Wheelbase.....	135 inches	121, 127 in.	128 inches	126, 135 in.	130 inches
Sizes of Tires.....	34x4 1/2 F. & R.	34x4 1/2 F. & R.	34x4 1/2 F. & R.	35x5 F. & R.	35x5 F. & R.
Wheels (Wood or Wire)	Optional	Wire	Wood	Wood	Wire
Type of Rear Springs...	1/2 elliptic	1/2 elliptic	Cantilever	Platform	1/2 elliptic
Drive and Control.....	Left, centre	Left, centre	Left, centre	Left	Left, centre
Type Gearset Bearings...	Ball	Ball	Ball	Ball	Roller
Rear Axle Bearings.....	Roller	Ball	Roller	Ball	Roller
No. Eng. Main Bearings	Three	Three	Three	Three	Three

DETAILS OF ELECTRIC PLEASURE CARS FOR 1917.

Name.....	Beardsley	Beardsley	Beardsley	Columbia	Detroit-Elect'c.	Fritchle	Fritchle
Model.....	.....	.....	.....	.....	62 to 68	Colonial B'h'm	Colonial Coupe
Miles Per Charge.....	75	90	100	90	85-100	60-90	75-100
Max. Speed.....	20 M. P. H.	25 M. P. H.	28 M. P. H.	21 M. P. H.	25 M. P. H.	20 M. P. H.	20 M. P. H.
Motor Type.....	Series	Series	Series	Series	Series	Compound	Compound
Battery.....	Exide	Exide	Exide	Gould	Exide	Fritchle	Fritchle
Controller Type.....	Barrel	Magnetic	Magnetic	Barrel	Drum	Drum	Drum
Speeds Forward.....	Four	Five	Five	Five	Five	Five	Five
Drive to R. W.....	Bevel	Bevel	Bevel	Worm	Worm	Worm	Worm
Rear Axle Type.....	1/2 float.	Full float.	Full float.	1/2 float.	Full float.	1/2 float.	1/2 float.
Tires, Rear.....	32x3 1/2	32x3 1/2	33x4	31x4	34x4 1/2	34x4	34x3 1/2
Steer. Control.....	Lever	Lever	Lever	Lever	Lever	Lever	Lever
Wheelbase.....	90 inches	96 inches	104 inches	100 inches	100 inches	102 inches	94 inches
Rear Springs.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	Elliptic	Elliptic	Elliptic
Wheels.....	Optional	Optional	Optional	Wire	Optional	Wood	Wood

Name.....	Hupp Yeats	Hupp Yeats	Milburn	Ohio	Ohio	Rauch & Lang	Rauch & Lang
Model.....	4 Regent B	5 Patrician	22	12	43 and 63	B X 7	J X 7
Miles Per Charge.....	75-90	90-100	85	75-100	75-100	100	60
Max. Speed.....	16 M. P. H.	16 M. P. H.	23 M. P. H.	25 M. P. H.	28 M. P. H.	26 M. P. H.	26 M. P. H.
Motor Type.....	Series	Series	Series	Series	Series	Compound	Compound
Battery.....	Exide	Exide	Philadelphia	Exide	Exide	Exide	Exide
Controller Type.....	Barrel	Barrel	Magnetic	Magnetic	Magnetic	Flat	Flat
Speeds Forward.....	Four	Four	Five	Five	Five	Six	Six
Drive to R. W.....	Worm	Worm	Worm	Bevel	Bevel	Worm	Worm
Rear Axle Type.....	1/2 float.	1/2 float.	1/2 float.	Full float.	Full float.	Full float.	Full float.
Tires, Rear.....	33x4	33x4	32x3 1/2	34x4	34x4 1/2	36x4	33x4 1/2
Steer. Control.....	Lever	Lever	Lever	Lever	Lever	Lever	Lever
Wheelbase.....	86 inches	100 inches	105 inches	98 inches	103 inches	102 inches	92, 102 inches
Rear Springs.....	1/2 elliptic	1/2 elliptic	.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheels.....	Wood	Wood	Wood	Optional	Optional	Optional	Optional

The Outstanding Features of Bodies for 1917.

BODY innovations on 1917 models have been largely confined to minor refinements and betterments in construction. This has been particularly true in the case of the enclosed body types, which seem to have reached the limit in development in their respective fields.

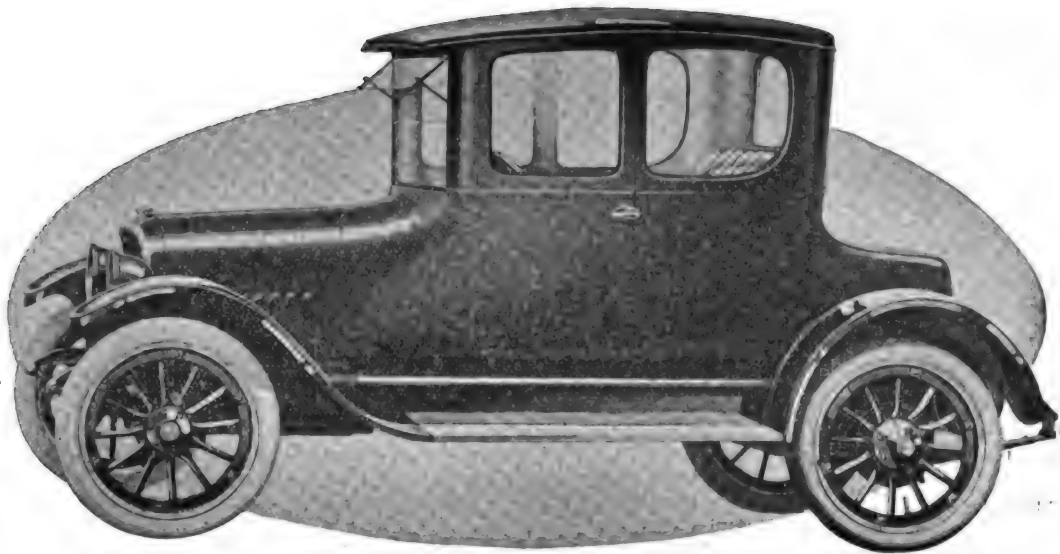
The streamline idea has been amplified and improved on many types and seating arrangements have been readjusted in other cases, but in the main there has been nothing of a really radical nature introduced this year in body styles, except on special orders.

There has been, however, a tendency toward rakish windshields, lower tops and cloverleaf roadster types of seat arrangement. Methods of window and curtain installation have also been improved, as have also means of raising tops and glass panels in enclosed bodies.

ALLEN COUPE AND SEDAN.

The coupe and sedan bodies on Allen cars offer striking examples of the modern art of body design for low priced cars. The coupe is a three-passenger enclosed body with interior trimmings in gray broad lace and dainty silk curtains. The gray color effect is carried out in the upholstery of the very roomy seats, which are in heavy all-wool gray whipcord. A centre dome light illuminates the interior for night driving.

The exterior finish is blue and black, the body panels and hood being blue, while black is color for the top above the head, the radiator and the fenders. The side windows sink completely out of sight and out of the



The Allen Enclosed Coupe Model.

way when thorough ventilation is desired. The full ventilating windshield is used and has a visor over the top.

The Allen sedan body is of the convertible type, in which the top is a permanent structure and of beautiful design. Its general appointments, including operation of windows, is similar to that employed in the coupe type. The windows can be let down out of sight and the door pillars are quickly detached by loosening thumb screws, and can be carried in a special compartment at the back of the rear seat. There is a space between the rear seat and the wall of the body, which is provided to permit ladies to lean back against the seats without crushing their hats.

Seating room for five passengers is provided with an aisle between the front seats. Gray Spanish imperial leather is

used as a covering for the seats.

The Willys-Overland Company's four-passenger sport model to sell at \$695, bids fair to be the hit of the year among the low priced cars.

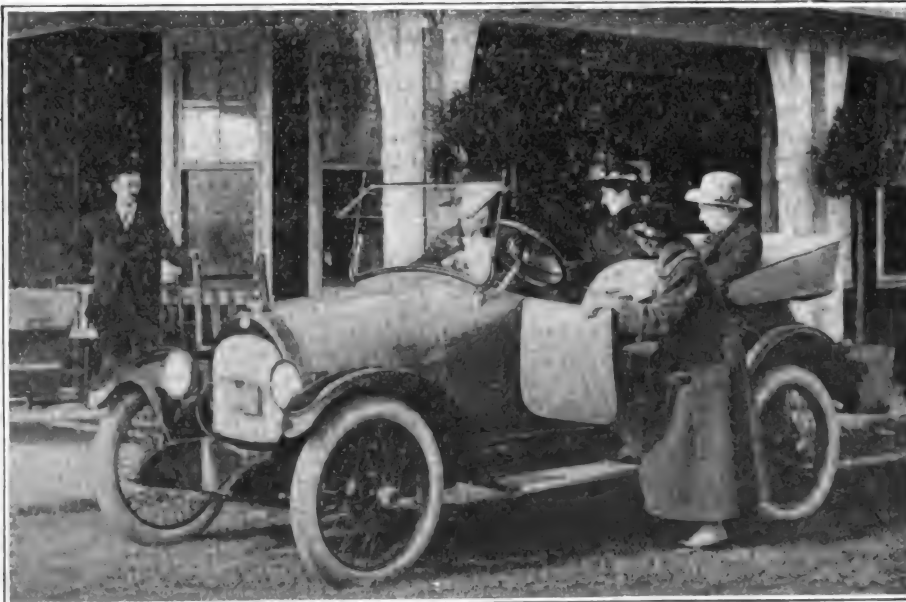
There have been many

sport models placed on the market, but they have sold at a prohibitive price for the average buyer. The new Overland Country Club model has established a class by itself and originality and distinctiveness mark the design of the highest quality. The body is a special feature of the model, having a compact and custom built appearance with a rich gray finish and long grained upholstery. The mohair top and sloping windshield augment its effect. The lustrous black fenders and trimmings and red wire wheels give a smart contrast to the body color.

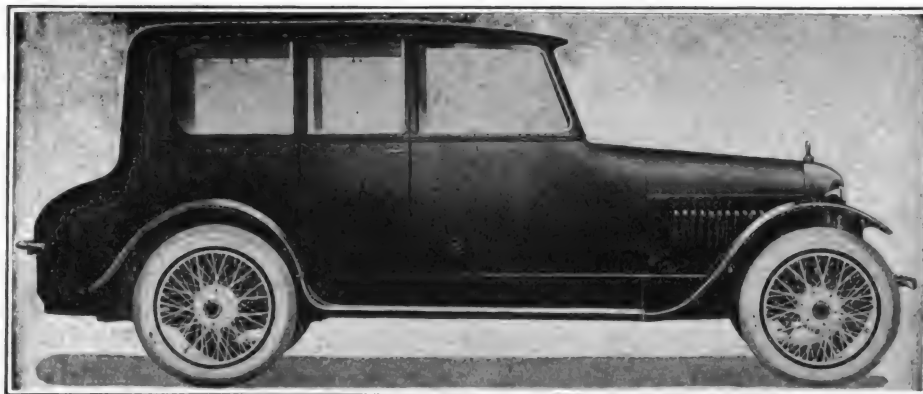
OVERLAND COUNTRY CLUB.

The seating arrangement is unique and distinctive. The two front seats move independently forward or back to accommodate the occupants and are separated by a wide aisle, which permits easy passage to and from the rear seats. While the rear seats are close up there is ample leg room and four passengers can ride in the car with comfort.

The wheelbase of the Country Club model is 104 inches. The engine is a four-cylinder en bloc type, with 3½-inch bore and five-inch stroke. A battery and distributor furnish the ignition and a Tillotson carburetor is used, fed by the vacuum feed system from a 12½-gallon gasoline tank situated under the rear deck. An extra wire wheel and a bracket for a



Overland Country Club Model, a New Sport Car.



Pathfinder the Great, the Most Radical Body Design of the Year.

spare tire are included in the equipment.

INTER-STATE BODY FEATURES.

The new Inter-State touring sedan, which will be seen for the first time at the New York Show, is of the true Springfield type and is painted in rich black and dark blue. An optional interior decorative scheme is offered, in brown Spanish leather and tan head lining or gray cloth and gray head lining. All the mountings are silver and the lighting is by a semi-direct system. The bodies have a hand rubbed, high lustre finish, extra wide and comfortable seats, upholstered in selected curled hair with equalizing cushion springs. The doors are of the easy opening, rattle-proof type. In general lines and construction the Inter-State models represent the very highest type of cars selling at less than \$1000.

A feature of the Inter-State exhibit at the show will be a four-passenger roadster finished in canary yellow with white strippings and high finished black leather. The body of this model is exceedingly roomy and comfortable and a large compartment is provided in the rear and also spacious pockets under the arm rests on each side of the rear seat.

NEW REGAL 4 THIRTY-TWO MODEL.

Among the most recently introduced body types and chassis models is the new Regal 4 Thirty-Two, made by the Regal Motor Car Company Detroit, Mich. It is known as model J, has a wheelbase of 108 inches, carries five passengers and sells for \$745. A striking feature of the new model is its neat streamline body, one of the true types of that design of body. It is a beautiful "job" and its lines are sweeping and clean, making one of the best appearing cars of the season of its price class.

The chassis features include a four-cylinder Regal made engine, L head type, cast en bloc with removable head. A constant level circulating splash system of lubrication is used. A float feed carburetor with hot water jacket is fed by vacuum system from a 14-gallon tank located at the rear of the chassis. The cooling system is of the thermo-syphon principle.

A Heinze-Springfield two-unit starting, lighting and ignition system is used. The breaker and distributor are of the magneto type and are located with coil and

regulating switch integral with the generator unit.

Transmission is accomplished through a leather faced cone clutch of light pressed steel with spring inserts under the leather facing, and a selective sliding gearset with three speeds forward and reverse.

The front axle is an I beam drop forg-



Spare Wheel and Tire Carrier of the New Pathfinder the Great.

ing with the tie rod located at the rear. The rear axle is of the three-quarter floating type, with differentials carried on Hyatt high duty bearings. Wheels are wooden, of the artillery type, equipped with demountable rims and 30x3½-inch tires. The front springs are semi-elliptic and the rear cantilever type.

The body is finished in Regal blue

and upholstered in straight grained, semi-gloss Fabrikoid. The wheels are also finished in Regal blue and the hood, fenders and radiator in black enamel.

NEW GRANT SEDAN MODELS.

Two new convertible sedan models, a five-passenger touring car and a three-passenger enclosed roadster, have been announced for the 1917 season by the Grant Motor Car Corporation, Cleveland, O.

These body types have been especially designed and incorporate the very latest ideas in interior trimming, lighting and ventilating. They are made on a hard wood frame, mitred and glued and screwed together.

The deck of the top is made of transverse bows, which are covered with light poplar slats. A layer of wadding covers this frame, which in turn is covered with cheese cloth, over which is placed a high grade weather and water proof covering. The rear quarters are made with upright bows, which are covered with sheet steel, which in turn is covered with a layer of wadding, cheese cloth and heavy water and weather proof material.

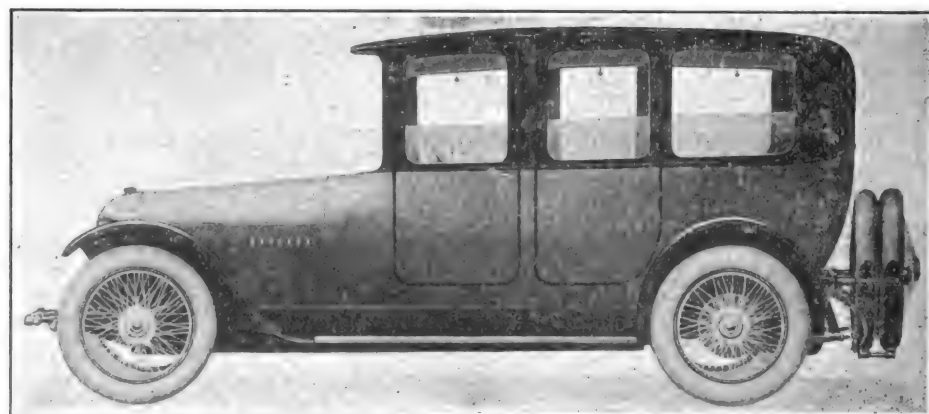
Forward of the large D windows the exterior is painted with 20 coats of brush work. The interior is trimmed in heavy head lining of a pleasing pattern. All the doors and windows are easily put in or removed.

A dome light with frosted cut glass rosette globe is set in the centre of the ceiling and is equipped with an Ediswan socket to prevent the bulb from working loose, and wired ready to be attached to the electric system of the car.

ELGIN BODIES FOR 1917.

The new series 17 Elgin touring car and roadster bodies are individualistic in design and the refinement is carried out in the minutest detail.

The five-passenger touring car body is designed with long stream lines, following out the European fashion of centre cowl, but yet embodying the yacht line effect. The windshield set at a receding angle carries out this effect distinctively. The upholstery is of black, long grain leather finish, well inlaid with French plaits. The exterior finish is deep royal blue with black hood, fenders and running gear. The interior has a loungy appearance.



The Pathfinder La Salle Sedan Model.

The roadster body has a very "snappy" appearance and the cozy seats are curved and tilted at the proper angle to permit the occupant to take a position of comfort similar to that enjoyed in an arm chair. The upholstery is the same as that employed in the touring car. The exterior finish is in Elgin gray with fenders and running gear in rich black.

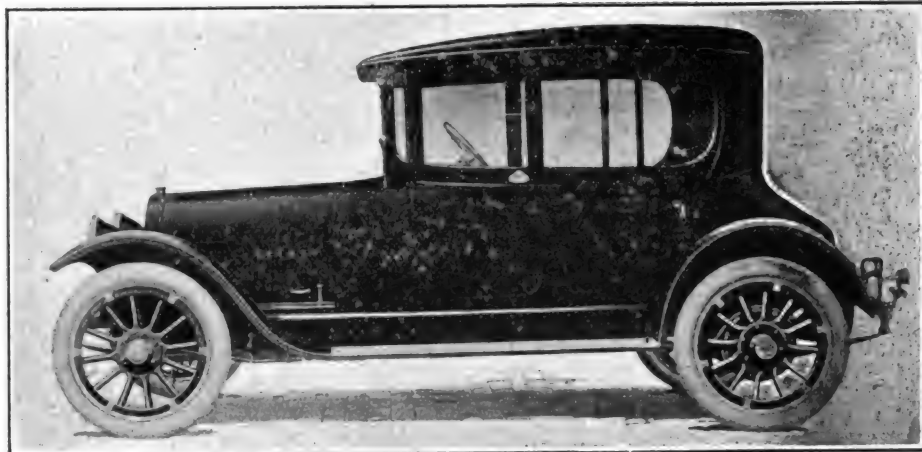
THE LUXURIOUS YALE EIGHT.

Of the 1917 touring car bodies few present such a finished and luxurious appearance as that of the Yale Eight. The exterior finish of ivory white, with black trimmings, sets it off distinctively and enhances the beautiful lines that are carried out in the body design. It has a tilted windshield, rolled body edges and is built with a double cowl dash, giving the appearance of a one-piece body from radiator to rear.

Unusually deep and soft upholstery is covered with genuine leather and both front and rear seats have extra high backs, which conform to the curvature of the spine in the natural manner for riding comfort. Spacious leather pockets are provided in all doors and built in the rear cowl space back of the front seats. The extra folding seats are entirely concealed when telescoped into the compartments behind the front seats.

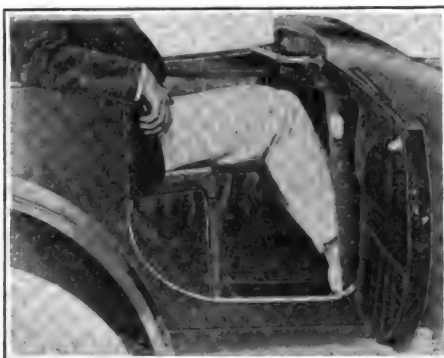
The Hackett car which is also a new-comer this year, has a touring car body designed on speed boat lines. It is an elaboration of the streamline effect; the straight lines run from the top corners of the radiator shoulders back to the rear seat back and forms a narrow deck extending all around the rim of the body and also forming the centre cowl between the tonneau and front seats. This effect is further accentuated by the low set of the seats and tilted windshield and similar angles followed out in the hood louvres.

The "Get Chummy" Pilot roadster, as the name suggests, is of the close-up seating arrangement design, or clover-leaf roadster body. It has many features, however, that are not incorporated in other bodies of this type. The form is along the full streamline effect, with an aisle between the front seats. The rear seat is extra wide, affording ample room for two passengers. There is a



One Type of Auburn Detachable Sedan Top.

large suit case compartment, entrance to which is had through the rear of the back seat, by means of a section which lifts out to make a large opening into the curved back of the body. This form of construction permits of a perfectly smooth and gracefully sloping deck



How Premier Provides Room for Occupant of Auxiliary Seat.

without parcel door or panel to break the continuity of the outline. The compartment is also water and dust proof.

AUBURN NEW DETACHABLE SEDAN TOPS.

The detachable sedan tops of the new Auburn models give the car an appearance of the regular type sedan, the detachable features being so inconspicuous

that they are not noticeable except on close inspection.

The contour of the tops harmonize perfectly with the graceful flowing curves of the body lines. The deck is neatly covered with high grade water proof top material and a water strip fastened above the windows and doors prevents water from dripping into the car. A heavy head lining of whipcord is used as a trimming on the interior of the top and sides. A dome light with a frosted cut glass rosette globe on the underside of the top, connected with a convenient switch, makes a handy and pleasing lighting arrangement.

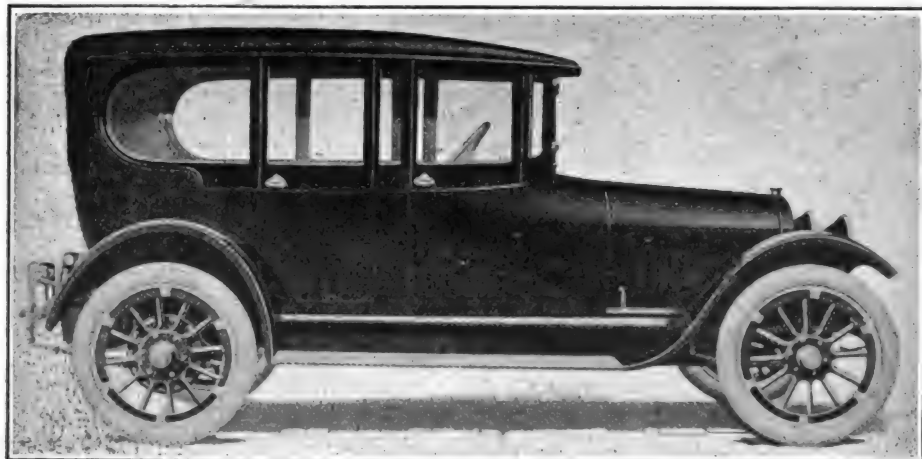
Heavy ground and polished plate glass is used in the door and window sashes. The car can be quickly changed into the touring type by removing the glass in the windows and doors. Jiffy curtains are carried in a concealed compartment in the forward part of the top ready for instant use.

The doors open full, swinging in one piece like a limousine door. Regular limousine door handles are used and the tops of the doors are attached to the bottoms of the upper sections.

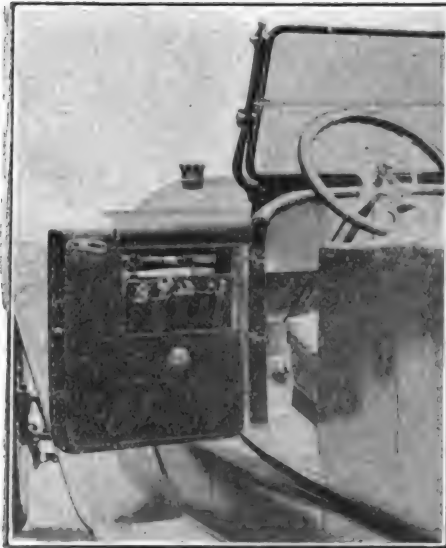
STUDEBAKER OFFERS ELEVEN BODY TYPES.

The Studebaker series "18" includes 11 different body models in which the principal changes are the folding extra seats in the rear compartments and adjustable front seats. When the folding seats are not in use they disappear completely under the permanent rear seats. They are also different in other respects from the conventional folding seats used in most cars as they are unusually roomy and are fitted with arms, which make them extremely comfortable. This arrangement of locating the extra seats also provides more room in the tonneau, both when the seats are in use and when folded away.

The designers have greatly improved the "chummy" effect of the interior. This has been accomplished by installing a separate adjustable seat on the right of the driver's seat instead of the double seat that is usually employed. Through this arrangement the occupant of the front seat can turn around and face the party occupying the rear seats or face the front. This seat, as well as the



Graceful Lines Dominate in This Auburn Detachable Sedan Top.



One of the Features of the Year, the Tool Pocket of the National Car.

driver's, also can be moved forward or backward a certain distance, to accommodate different people.

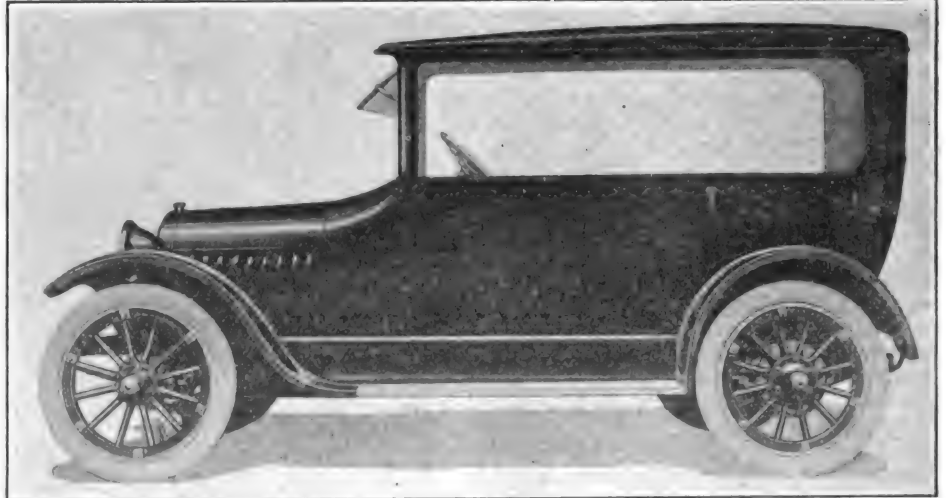
The Studebaker "Every Weather" top model, which is of the convertible type, is designed for cold and stormy weather. The tops fit the bodies very closely. The windshields are built especially for the bodies and are of the overlapping design.

KISSELKAR SHOWS WIDE RANGE.

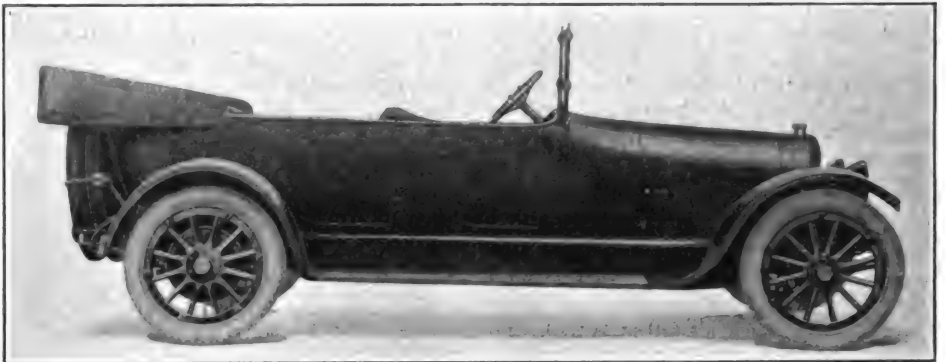
The Kissel All-Year bodies have created considerable interest, as they all have been designed with the convertible principle as the main object, yet embody the utmost in coach construction practice.

The frames are of extra heavy selected ash and elm rigidly joined and the doors are of a second growth of ash covered with a silver finish sheet steel. The halves fit snugly together into the frame at both top and bottom. Three-ply paneled white wood and heavy duck canvas, laminated, is used in the roof construction, eliminating the possibilities of warping or peeling.

The windows are of French plate glass set in hard, channel rubber, to make them absolutely water proof even in driving storms. The windows drop



The Inter-State Touring Sedan, with Windows Removed.



The Apperson Seven-Passenger Roadplane.

into the lower half of the doors and may be adjusted at any height.

The lining in the standard tops is of black leather motor cloth, special leather or other material will be used in the lining if desired at small additional cost. A large centre dome light is installed for illumination, and the connection with the lighting system is made automatically when the upper and lower sections of the bodies are joined.

New and improved attachment brackets are used in joining the tops to the bodies. They are located at 10 points under the upholstery. Felt, rubber and non-squeak material is used to prevent

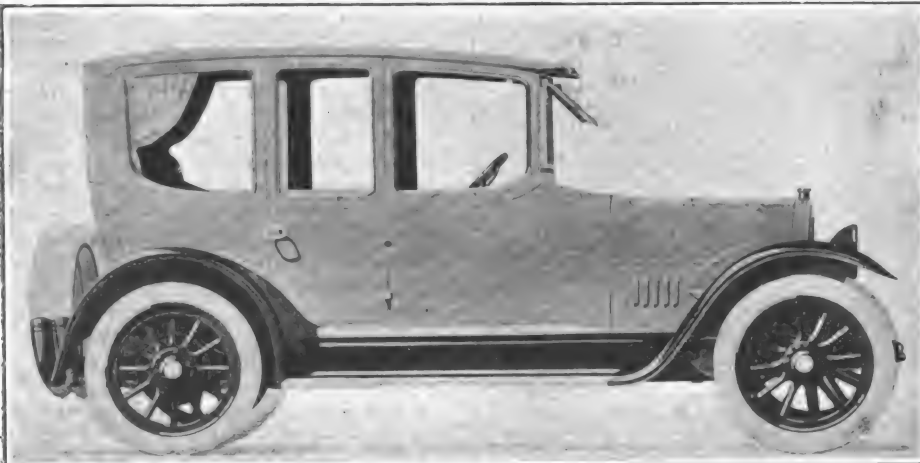
rattling or working noises.

The front seats are of the individual type, making all the models, when converted, into one compartment cars. The upholstery is very deep and the seats are tilted to fit the back. The door openings are extra wide and spacious storage facilities are provided beneath the seats.

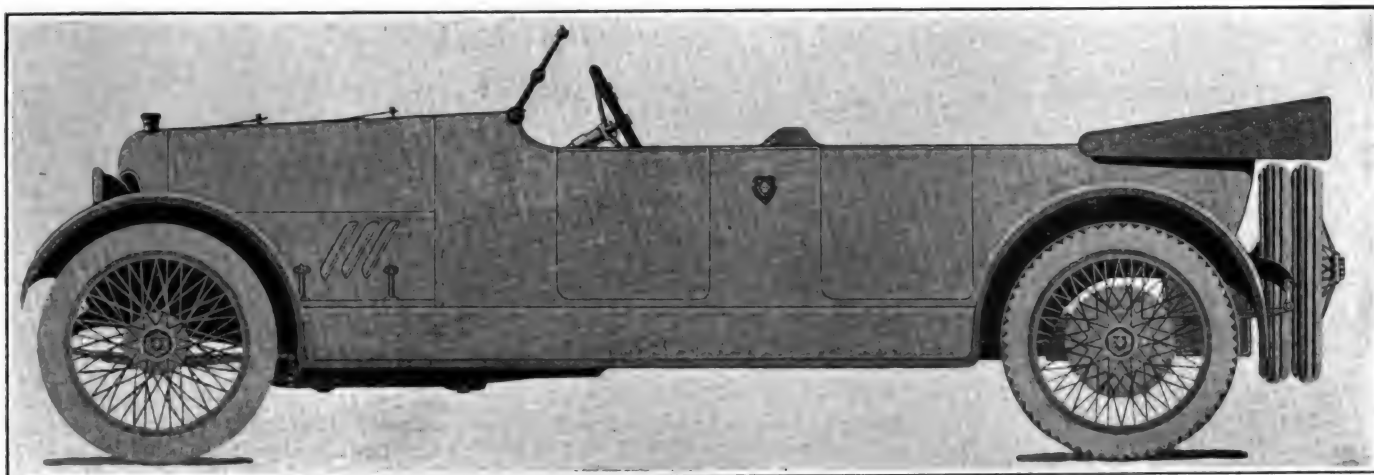
NEW KING DESIGN FOR 1917.

The new series of King Eights, which will be exhibited at the national shows, reveals a number of distinguishing features in the body designs of both the touring car model and the new Four-some. The entire lines of the new models have been changed, in connection with the use of a new shield shaped radiator, a profile view showing a straight line from the top of the cowl to the radiator. From the windshield the side lines sweep down and back to the cowl of the front seats, which extends slightly above the level of the sides.

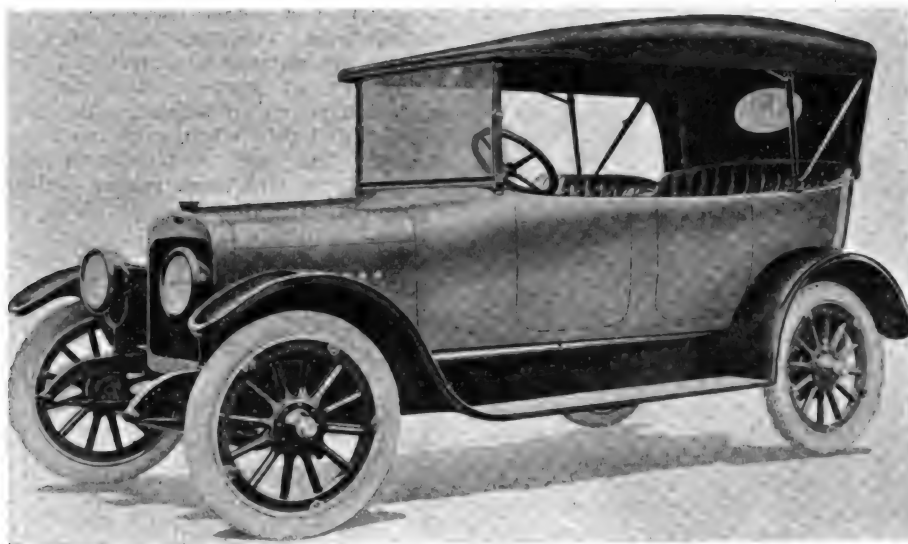
Interior refinements and improvements are also a feature of the new touring car bodies. In the centre of the tonneau cowl there is a light which can be used either to illuminate the rear seating space or can be pulled out and used as a trouble lamp, being equipped with a self-winding flexible cord sufficient in length to reach any part of the car. A small compartment is also provided under the tonneau cowl board for miscellaneous articles and a specially arranged drawer is located under the front seat for carrying tools. The body finish on touring car is phaeton green.



The Kissel All-Year Sedan on the Gibraltar Chassis.



The New Geneva, Whose Rakish Lines Suggest Speed and Individuality.



The Regal 4-Thirty-Two Has True Streamlines.

The King sedan Springfield model for 1917 seats seven passengers instead of five as in last year's car of this type. The front seats are of the individual type with auxiliary seats folding into a rear compartment. Worsted cloth of a color to match the paint scheme is used in the upholstery and there is a compartment in the rear of the tonneau seat for storing the windows and panels when the car is to be driven open with only the top in place. The sedan is supplied in either deep maroon, beaver brown or suburban blue.

A new King model, the four-passenger Foursome, has long, low rakish lines and is of the sporty type. There are two comfortable individual bucket seats, 19 inches wide and 19 inches long, in the driver's compartment, and the rear seat is 42 inches wide and 19 inches deep. There is a special carrying compartment for small luggage of unusually liberal dimensions which can be gotten into without leaving the car or disturbing the passengers. Oxford lake is the standard color finish on the Foursome.

APPERSON OFFERS MANY NEW FEATURES.

The Apperson Roadplane, 1917 seven-

passenger touring car, has a new body design, which incorporates a number of pleasing features which greatly improve the appearance of the car and increase the comfort of the passengers.

Two auxiliary seats disappear completely into the backs of the front seats when not in use. There is an aisle way

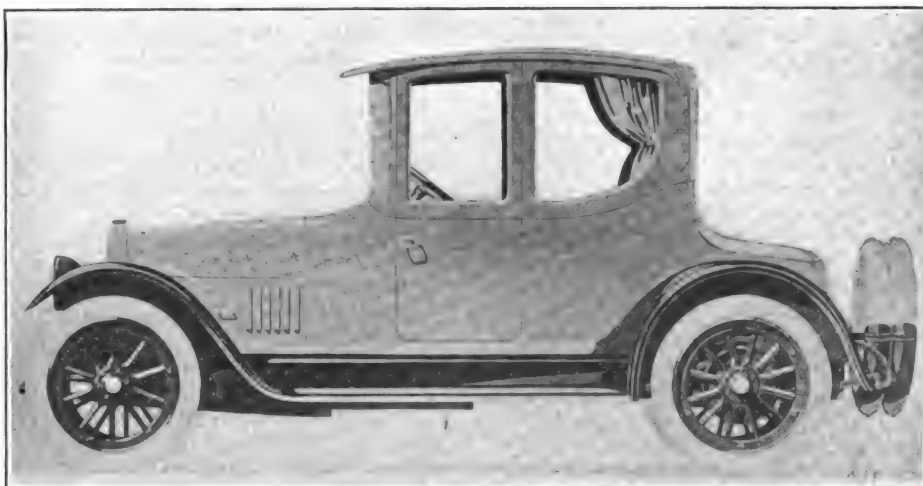
between the front seats, which are of the double cowl type, built integral with the sides of the body so that a substantial safe construction is assured. The exterior lines are similar to the 1916 Apperson bodies, being of full streamline type.

The principal change in the new body is in the arrangement of the tonneau. The rear seat is deeper and wider than any ever brought out by the Apperson company before, and the back is high enough to insure comfortable riding even to the tallest person. A new method of upholstery has also been worked out with form fitting springs, which fit the back of the occupant snugly and give a feeling of support. The cushion is deep, soft and made to incline to the rear so that a person sitting upon it touches it throughout its entire depth.

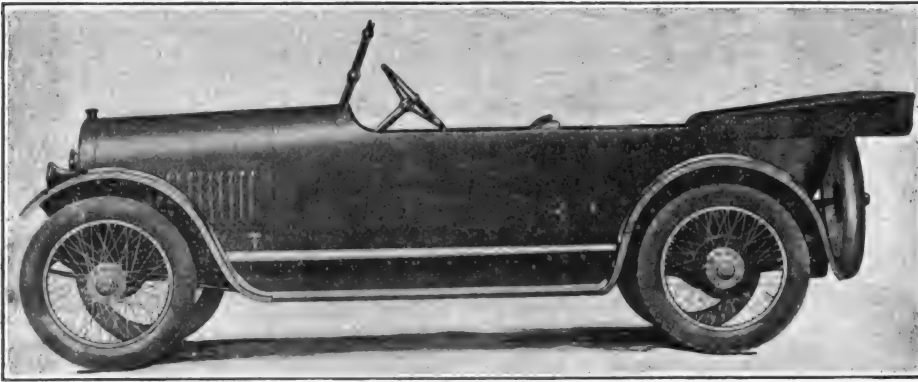
A change has also been made in the method of attaching the fenders to the running boards, the junction being covered by the running board binding making a neat joint. The fender lines have also been changed to present a more graceful contour.

NATIONAL BODIES MUCH IMPROVED.

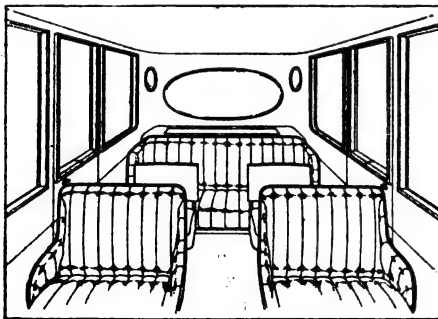
The National Highway 12-cylinder car for 1917 seats seven passengers instead of six, as in last year's model, and also has a number of improvements and new



The KisselKar All-Year Gibraltar Coupe.



The New King Foursome with Top Down.



Seating Arrangement of the King Sedan, Springfield Type.

features in the body design.

The body has been lengthened three inches, giving more room in both the driving compartment and tonneau. It has also been widened. Of streamline design with centre cowl and tilted windshield, its appearance is all that could be asked for in any car. The front seats are divided with an aisleway between and have compartments in the backs equipped with locks. The auxiliary seats disappear forward under the centre cowl, leaving a smooth tonneau floor, the seat supports fitting flush. The side curtains fit flush with the doors and by a special arrangement open and shut with the doors.

Five different body styles are furnished in the "Highway Twelve," a seven-passenger touring car, a four-passenger touring car, a four-passenger roadster, a five-passenger all-weather sedan and a three-passenger coupe.

As on former models the tool compartment is located in a pocket in the left forward door. The bodies are equipped with a new tire holder in the rear, which requires the use of only one strap and is provided with a means of locking. The gasoline tank has an opening at the right side near the fender and is equipped with a cap hung on a hinge, which prevents it from dropping off or being dropped.

PATHFINDER DISPLAYS MUCH ORIGINALITY.

The new Pathfinder models stand out distinctly from all other 1917 models as embodying the most original body designs, which present a radical departure from the conventional types on the market.

One of the most striking features in this new design is at the rear of the body and is formed of a new type of spare wheel and tire carrier, which revolves beneath an extension of the body made to conform to the shape of the revolving container. By this method of storing the wheel and tires the makers claim they have not only eliminated all light and frail parts at the rear end, such as tire rack, license plate brackets and tail lamp, but the full stream lines of the bodies are more beautifully accentuated.

Another novel and very practical innovation is a concealed top. When not in use the top, which is of the one-man type, folds away in a compartment in the deck, preventing the accumulation of dirt and the consequent unsightliness resulting from an untidy top around the rear tonneau. It also does away with the top cover. When the top has been folded back into its compartment the cover of the compartment, which is a one-piece section, closes down tight and flush with the deck and does not form an obstruction to the view from the rear. Another advantage claimed for this innovation and the revolving tire rack in combination, is that they serve to lower the centre of gravity of the entire car and thereby increase its safety and add to riding qualities.

This new model is a completely new car throughout. The wheelbase is 135 inches, with valve in the head 12-cylinder engine. The chassis includes a multiple disc clutch, three-speed transmission, Spicer universal joints, American axles, Gemmer steering gear and Delco electric system. The thermostatic control is used in the cooling system, as is a shell and core type radiator. The rear springs are 60 inches in length.

The Pathfinder open models include a seven-passenger touring roadster and a four-passenger touring roadster, with tonneau windshield. The prices on these models is \$3250. The Pathfinder line for 1917 also includes sedan models, limousines, Berline, town car and landaulet.

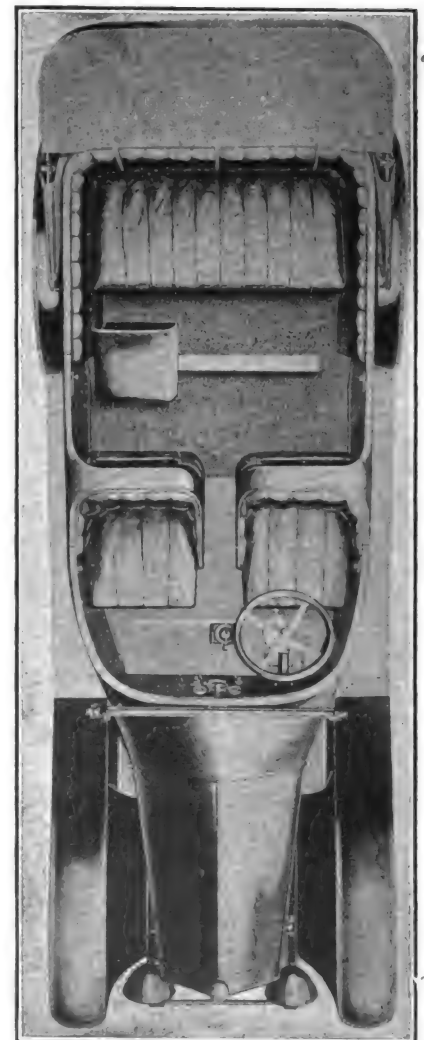
In the class of extreme luxurious body designs the Pathfinder Berline limousine represents ultra distinctiveness as a strictly individual type.

It is a superb creation of coach making, furnishing and decoration. The interior

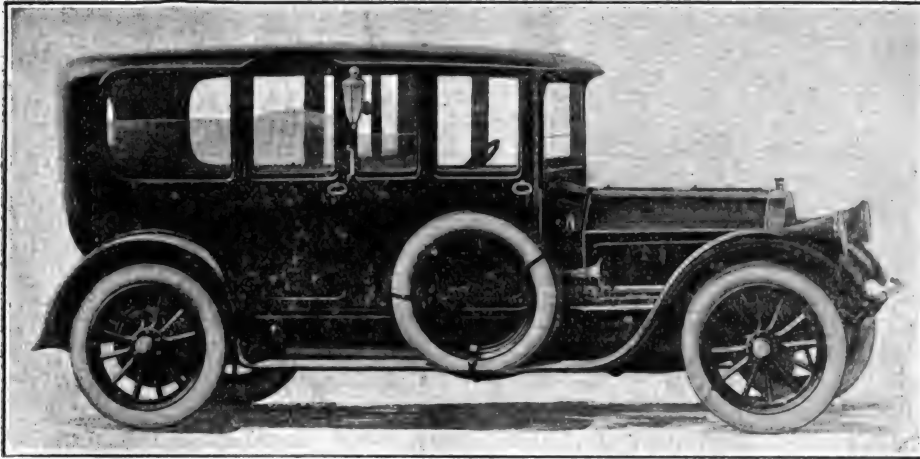
has a home-like elegance with rich though quiet tapestries, velvety carpets, locks and foot cushions. Extremely deep and soft back upholstery and cushions give maximum riding qualities in keeping with the luxury of the design. The finest of fabrics are used in trimming, with silk roller curtains at each window matching the general color scheme of the interior finish.

Arm rests are located at each side of the rear windows. Conveniently located, although concealed, are the latest type of telephone to driver, cigar lighter, cut glass flower vase, vanity case equipped with bottles, mirror, watch, etc., card case and ash tray. A robe rail is located at the rear of the driver's seat, with umbrella holders at either end. Auxiliary folding seats are so arranged as to fold forward from view when not in use, or one can instantly be placed in use.

Heavy plate glass is used in the windows and doors and the latest style of construction is used to raise and lower the windows. The dome light used for interior illumination is controlled by individual switch or when not in use it is connected so as to automatically light with foot lights when side doors are opened. The door handles and grab handles have hard black rubber centres with nickel trimmings.



Interior of the National Highway Twelve for 1917.



Pierce-Arrow Vestibule Brougham, Model B-4, Acme of Splendid Coach Work.

Long grained hand buffed leather is used in the upholstery in the driver's compartment. This compartment has a separate dome light. The upper portion of the body is painted a solid black and the lower part blue-black or wine.

PACKARD'S BODY FEATURE FOR 1917.

The bodies for the 1917 models of the Packard twin sixes are as distinctive in type as is the car itself. They not only present new lines and many new features, but are hung considerably lower, greatly improving their appearance. The chassis wheelbase on both models have been increased, making for longer, roomier and more comfortable bodies.

In the four-passenger runabout, which is the very newest body production of the Packard plant, several attractive and interesting innovations are presented. The front seats are of the individual type with a passageway between and the rear seats afford comfortable positions for two persons. A new type of upholstery springs is used, making it possible to lower all seats.

The upholstery in the open bodies is straight grained, hand buffed leather, plaited instead of tufted, while for the enclosed bodies a wide range of exclusive upholstery is offered. The folding seats are of the forward disappearing type in the touring bodies, except the "2-35" salon and the six-passenger enclosed bodies.

NO SHARP BREAKS IN MERCER BODIES.

The bodies on the 1917 line of Mercer cars, including a four-passenger and six-passenger touring car and runabout and raceabout types, are all designed along the streamline effect, but without a straight line in the sides or a break from the crown of the radiator to the rear tire carrier.

The six-passenger model has two seats of the auxiliary type which, when not in use, can be folded into a compartment under the centre cowl. These compartments and the entire back of the front seats are beautifully finished in black walnut paneling, with doors that roll out of sight just like the tops of roll top desks and hide the extra seats when they are not in use.

In the four-passenger car, which is of the sporting type, black walnut paneling is also used back of the front seats. There are three separate compartments built in under the cowl for carrying luggage and miscellaneous items.

The runabout and raceabout models have bodies similar in design, only smaller, and are furnished in the same Mercer stock colors, which include gun-metal (egg shell finish), green, blue, maroon, gray and golden brown with Spanish leather upholstery.

PIERCE-ARROW COMPANY REFINES BODIES.

The "Series Four" Pierce-Arrow cars present little change in chassis construction, but a number of refinements have been made in body designs. A new four-passenger model is introduced, on either the 38-horsepower, 48-horsepower or 66-horsepower chassis. This body is a departure from the former practice of the company, which has been a leader in distinctive body designing. It has individual front seats, with an aisle way 7½ inches wide. The rear seat is 43 inches wide and 19 inches deep and the rear of the body is tapered in giving the tonneau seat a very comfortable and cozy fit for two occupants. The exterior of the body is along the distinctive lines of all Pierce-Arrow bodies.

The new Pierce-Arrow open bodies have slightly higher sides and slightly

lower seats, which improvements were made to increase the sense of security felt by the passengers. Lines and mouldings are somewhat altered to gain simplicity and the rear mudguards are set closer to the wheels. Improvements on the cape top have made it easier to handle and the method of storing the jiffy curtains has been changed so that they are not only more accessible, but are kept in better condition. An improvement in the appearance of the top lining has also been made. Disappearing auxiliary seats have been made standard equipment in place of the old folding type. A locked pocket in the left front door has been provided for the small tools.

There has been little change made in the enclosed body types, except that the rear mudguards are closer to the wheels and the flat roof types will be considered standard in place of the domed roofs.

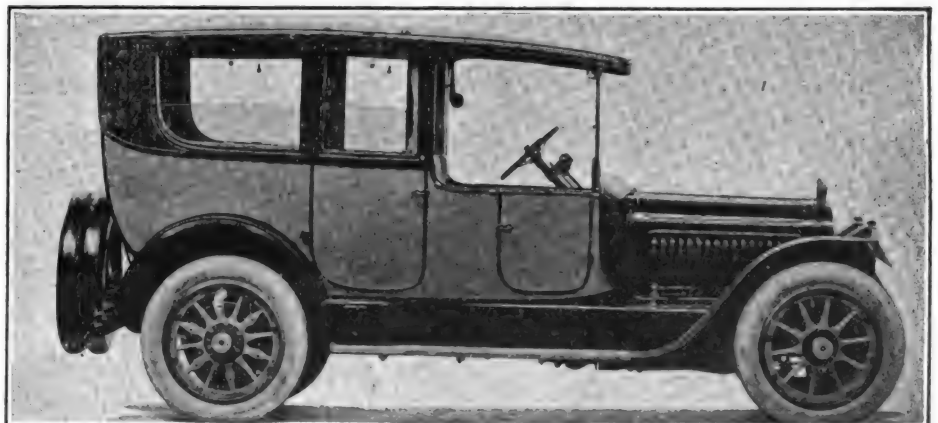
NEW AMERICAN SIX HAS DISTINCTIVE LINES.

The American Motors Corporation, Plainfield, N. J., has, in the American Six, contributed a noteworthy product to the field of six-cylinder cars in the medium price class. It has big dimensions, the wheelbase being 122 inches. It is strongly constructed and has an exceptionally distinctive appearance with a low hung, full stream line, double cowl body.

The 45 horsepower power plant consists of a six-cylinder 3x5 engine, cast en bloc, with heads integral. It is equipped with a Zenith carburetor, gravity fed, Gray & Davis ignition, starting and lighting systems. The cooling system embodies a pump circulator and cellular type radiator.

Power is transmitted through a Borg & Beck dry disc clutch and a Mechanics Machine Company gear set. A Salisbury rear axle is used with a gear ratio of 4 5/12 to 1. The springs are semi-elliptic, rear underslung. Hotchkiss drive is used. The wheels are of wooden artillery type, fitted with Detroit clincher, demountable rims and 32x4-inch tires.

At present the company is confining its production to a five-passenger touring car which sells fully equipped for \$1285.



The Packard Twin-Six Limousine, a Splendid Example of This Type of Body.

NEW JERSEY'S LAWS UPHOLD.

Motorists are Disappointed by Decision of United States Supreme Court.

The New Jersey license laws governing the registration of automobiles in that state, enacted in 1908, were declared constitutional by the Supreme Court of the United States in a decision handed down recently.

The matter was brought to the Supreme Court through an appeal made by Frank J. Kane of New York City, who was convicted in New Jersey under one of the provisions of the automobile license act. The case attracted widespread attention, as it brought in the legal counsel for both the American Automobile Association and the National Automobile Chamber of Commerce, who presented arguments before the court.

Charles Thaddeus Terry, counsel for the N. A. C. C., states in connection with the decision that it relates only to the right to license non-residents and does not dispose of the contention that the taxation of road vehicles for road maintenance, under the guise of registration or licensing, is unconstitutional.

Kane's lawyers attacked the Jersey law on the grounds that it was discriminatory. The State of New Jersey claimed that exemption of horse drawn vehicles was reasonable and that non-residents have no legal right to the free use of the roads.

It was also contended by the defendant that the taxes raised in New Jersey were not solely for administration, costs of regulation and registration of motor traffic, and that the taxation of road vehicles for road maintenance is unconstitutional. On this point, the one referred to by Mr. Terry, the New Jersey courts had ruled that raising money by licenses imposed on the use of cars, rather than upon the cars themselves, was clearly within the state's police powers, to com-

pensate it for the wear and tear on the highways.

The attorneys representing New Jersey contended also that Kane could not attack the law in his case on the grounds that it hindered interstate commerce, as he was convicted of violation while touring through Paterson to Delaware Water Gap, Penn., making the point that commerce is more than pleasure.

INSTITUTE CAMPAIGN AGAINST MOTOR THIEVES.

The Bay State Automobile Association has instituted an active campaign against automobile thieves in that state. At a recent meeting the directors empowered the committee in charge of the campaign to spend several hundred dollars in organizing an effective movement to check the thefts of machines which have been increasing in alarming numbers in the Bay State.

Walter R. Bliss of the Goodyear Tire and Rubber Company, Walter Williams and James T. Sullivan comprise the committee. Conferences will be held with the police commissioner and superintendent of the police of the city of Boston.

PERFORMANCE OF PEERLESS AT UNIONTOWN.

The special entry of the Hiland Automobile Company, which won the dealers' race at the Uniontown speedway at Uniontown, Penn., and which was driven by I. P. Fetterman, who maintained an average speed of 80 miles an hour during the 50 miles, was a Peerless stripped chassis with a Peerless built eight-cyl-

inder motor. The motor is the same that is used in the Peerless model 56 eight, except for a few minor changes, including a different carburetor setting, raised compression and an increased oil supply.

The Uniontown speedway is a circular board track, acutely pitched at the turns. The laps are 1½ miles in length, 48 laps being covered by the winner in 40 minutes and 18 seconds. The Peerless made the 50 miles without a stop and covered some laps at the rate of 85 miles an hour and at times touched 95.

THIRD ANNIVERSARY OF LINCOLN HIGHWAY.

The Lincoln Highway Association has issued a booklet describing the history of the Lincoln Highway and the progress that has been made in building the memorial road from coast to coast. It contains an introduction contributed by Henry B. Joy, president of the association. Mr. Joy summarizes the objects and purposes of the organization and makes the significant statement that the highway in its present state is the best known and the longest through connecting road in the world and the road upon which, as a definite entity, more time effort and money have been expended than upon any other highway in the world's history from the time of the Applan Way to the present day.

Pictures of the men who have been identified with the great project are shown in a group and views of scenes along the highway in the different states illustrate the story.

AUSTRALIA PURCHASES MORE MOTOR CARS.

Australia, during the first six months of the current year, purchased over twice as many motor cars in this country than in the corresponding period in 1915. The shipments from Canada to that country were also increased owing to the fact that the Canadian Ford company supplies the demand there for Fords.

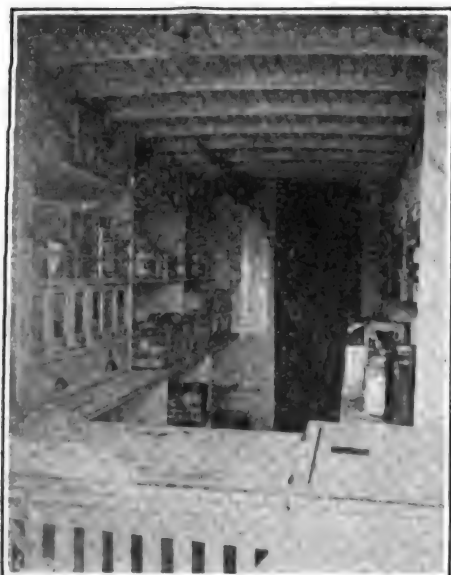
The following table shows the imports of motor cars, bodies and accessories for the first six months of 1916 and for the first six months of 1915:

Articles and countries of origin.	1915	1916
Chassis for motor cars, etc.....	\$2,037,837	\$4,177,754
United States..	841,749	2,707,297
Belgium	23,963	1,363
Canada	346,865	798,232
France	96,804	111,613
Germany	16,994	1,659
Italy	138,092	243,072
Switzerland ...	1,552	10,146
United Kingdom	571,819	303,962

Articles and countries of origin.	1915	1916
Bodies for motor cars, etc.....	\$437,474	\$1,054,814
United States..	229,927	843,355
Canada	78,166	159,066



The Peerless Car That Won at Uniontown.



Showing Interior Arrangement of Motor Truck Grocery Store.

France	2,482	10,298
Germany	1,800	190
Italy	7,699	10,633
United Kingdom	117,030	30,834

During that period \$2,558,538 worth of rubber manufactures, under which head tires are listed, were imported by Australia, and of that total the United States supplied \$1,793,826 worth.

OPPOSE HIGHER MOTOR TAXATION IN CANADA.

A bill introduced in the Legislature at Quebec, Canada, providing for an increase in the taxation on motor vehicles, met with strong opposition on the grounds that the government was imposing grievous burdens of taxation and taking away the right of municipalities in levying these taxes.

Walter Mitchell, provincial treasurer, who introduced the bill, said that the changes brought about by the new law were in keeping with what was considered the best practise in taxation in other countries. Under the bill the taxation would be regulated by the horsepower of the vehicle taxed, and Mr. Mitchell said that it was not unusual for the state to collect the taxes, it being done in every country of the world.

HARTFORD DEALERS PLAN AUTO EXHIBIT.

At a meeting of the Hartford Automobile Dealers' Association, held during the first week of the present month, plans for an automobile show to be held Feb. 10-17 were discussed. Bernard F. Smith, who has been chairman of the show committee for several years, was re-elected, as were Russel P. Taber and John D. Evans. The show is to be staged in the State Armory and will be the 10th annual event.

GROCERY STORE ON WHEELS.

Arkansas Merchant Adopts Unique Method of Reducing the High Cost of Living.

E. E. Moseley of Pine Bluff, Ark., is the proprietor of what is probably the most complete grocery on wheels in the world. Over a year ago Moseley conceived the idea that if a pedlar with a one-horse team could do a successful business in groceries among the suburban and country people, a completely stocked store carried about on a motor truck would prove even more lucrative. He bought a two-ton Reo chassis from the Reo factory, ordering it by mail, without either inspection or demonstration. He designed and built his own body which is of a unique type. It is 16 feet long, six feet wide and six feet two inches high and built of ash yellow pine and sheet steel. In the rear there is a vestibule, affording ample standing room for six people, and a vegetable case.

An ice box is built into and forms part of the counter when closed and the other part of the counter swings over on hinges to permit of the entry and exit of the store keeper. A confectionary case is provided and drawers and shelves are built in along the sides with space for display. The rods holding the merchandise in place on the shelves automatically spring back after being swung down to get at the different articles.

On the outside and underneath the body are two chicken coops with hinged swing back bottoms and two galvanized tanks for coal oil and gasoline. The truck carries a stock of \$700 to \$800 worth of goods at a time and this stock is replenished twice daily at the garage warehouse where a large stock of goods is kept.

A partition, screen door and window

separate the driver's compartment from the sales room. The doors and windows are all screened and provided with drop-sashes to admit plenty of air in the summer time. In the winter the entire car is heated by radiators warmed with the exhaust gases from the motor. Electric lights are used for illuminating the store, the current being taken from the batteries used in connection with the starting system.

When Mr. Moseley started the car made a circuit of 15 miles daily, but now the machine only covers a route of five miles on which an average of 100 stops are made each day. The growth of the business attracted the attention of many customers off the regular route and Mr. Moseley was obliged to inaugurate an auxiliary delivery system with a light car to fill the orders that were telephoned in.

BIG EXHIBITION AT BROOKLYN AUTO SHOW.

The plans for the show to be held by the Brooklyn Motor Vehicle Dealers' Association in the Twenty-third Regiment Armory, Brooklyn, N. Y., Feb. 24 to March 3, indicate that the exhibition of cars will be more extensive than at any of the five preceding shows in that city.

There is more floor space in the armory than in Madison Square Garden, and applications to date indicate that every square foot will be occupied by cars and trucks. It is planned to give over all this space to car exhibits, while accessories will be shown elsewhere.



The World's Most Complete Grocery Store on Wheels.

JUDGE GIVES SAFETY ADVICE

Traffic Experts Discuss Means of Reducing the Sum Total of Accidents Due to Vehicles.

At the Safety First Convention held in Baltimore, Md., Judge Joseph Sabath of Chicago, Ill., gave some interesting advice on how the traffic law violators should be treated to obtain the most efficient and satisfactory results.

Judge Sabath, who has tried over 20,000 cases in the traffic court at Chicago, in expressing the opinion that fines and penalties were the least important part of his work, stated that the man who is fined usually leaves the court defiant; he considers himself squared with the law. His penalty is paid and he owes nothing more to society. But if he finds a judge who patiently and earnestly points out to him the seriousness of his offences because of the danger to society his better self responds.

Traffic experts from all over the country drafted a uniform traffic code and the street traffic code committee made the following recommendations: Uniformity in number plates, transparently illuminated number plates, examination into the qualifications, mental, moral and physical, of every applicant for a license, and for the permanent disqualification of every operator twice convicted of operating a car while under the influence of liquor.

Dr. H. W. Rowe, president of the American Automobile Association, in the course of his address said that if pedestrians were confined to the sidewalks and were not permitted to cross the streets anywhere except at properly designated crossings, it would eliminate the cause of most accidents.

Police Commissioner Arthur Woods of New York City told the convention that it is utterly absurd and illogical to permit any inexperienced person to take upon the public highways a potential engine of destruction, meaning a motor car.

He also charged that constructive legislation for licensing all automobile drivers in the interest of public safety had been blocked by misguided combinations.

"CHARTER OAK" WILL BE AT BOSTON SHOW.

The Charter Oak car, to be manufactured by the Eastern Motors Syndicate of Hartford, Conn., will be shown at the Boston automobile show for the first time if the present plans of the officials are carried out. The company has leased the old factory of the American Hardware Company at New Britain and it is expected that production will be under way by April 1 of the approaching year.

A feature of the construction of the Charter Oak, which will be known as the "Specialists' car," is that it will be

made up of parts manufactured by specialists in their respective lines. A roadster, touring car and bare chassis will be marketed with the minimum price set at \$3500.

Manufacturers of the parts that will go into the car are now shipping to the New Britain factory and work will be under way in a short time.

AUTOMOBILE MECHANICS CORP. IN NEW LOCATION.

The Automobile Mechanics Corporation, one of the largest automobile repairing companies in the country, has taken extensive lofts at 221 W. 53d street, around the corner from Broadway in New York City. The organization is made up of automobile mechanics of long experience who are well qualified for overhauling motors, trimming, painting and general work of repair.

The company has acquired the Abbott-Detroit Parts Corporation, Marion Auto Service Company, Inc., the Elcar service for the eastern part of the United States and a large stock of Pullman parts for the Pullman service, from

1910 to 1916 models inclusive. Eugene J. Berger is the manager of the parts and service departments.

CALIFORNIANS WILL TOUR EASTWARD.

Californian motor enthusiasts are planning tours over the Lincoln Highway in the spring and if the present plans for the invasion of the East are carried out New York City will witness the arrival of the largest caravan of touring cars from the Golden Gate that ever crossed the continent.

It is proposed to secure at least 100 cars to make up the expedition and, while en route, the owners will take their time to study and enjoy the country through which the highway passes. The tours, it is understood, will be arranged on a two months' schedule, which will afford ample time for covering the trip and sightseeing.

BANKHEAD HIGHWAY ASSOCIATION FORMED.

As a fitting recognition for Senator John H. Bankhead's services in securing the passage of the Federal Aid Roads Bill, an organization has been formed to build a highway from Memphis, Tenn., via Birmingham, Ala., to Atlanta, Ga., to be known as the Bankhead Highway. This organization, which is called the Bankhead Highway Association, is composed of prominent citizens of Georgia, Alabama, Tennessee and Mississippi.

COMING EVENTS

December.

Show, Cleveland, O. Dec. 30-Jan. 6
Show, York, Penn. Dec. 30-Jan. 6

January.

Show, New York City Jan. 6-13
Convention, Rubber Club of America, New York City Jan. 8
Banquet, N. A. C. C., New York City, Waldorf-Astoria Hotel Jan. 9
Convention, Iowa Retail Auto Dealers' Ass'n., Fort Dodge, Ia. Jan. 9-10
Convention, S. A. E., Mid-Winter Meeting at New York City Jan. 9-11
Show, Philadelphia, Penn. Jan. 12-20
Show, Cleveland, O. Jan. 13-20
Show, Montreal, Que. Jan. 20-27
Show, Detroit, Mich. Jan. 20-27
Show, Rochester, N. Y. Jan. 22-27
Show, Buffalo, N. Y. Jan. 22-27
Show, Lowell, Mass. Jan. 22-27
Show, Oklahoma City, Okla. Jan. 23-26
Show, New Bedford, Mass. Jan. 23-27
Show, Chicago. Jan. 27-Feb. 2
Show, Wilmington, Del. Jan. 29-Feb. 3
Show, Fall River, Mass. Jan. 29-Feb. 3

February.

Convention, A. A. G. O., Chicago Feb. 1-2
Show, Minneapolis, Minn. Feb. 3-10

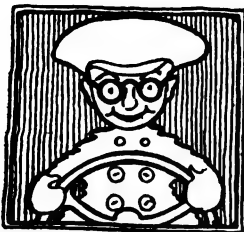
Convention, American Road Builders' Ass'n., Boston, Mass. Feb. 5-9
Show, Hartford, Conn. Feb. 10-17
Show, San Francisco. Feb. 10-18
Show, Elmira, N. Y. Feb. 12-17
Show, Louisville, Ky. Feb. 12-17
Show, Indianapolis, Ind. Feb. 12-17
Show, Sioux City, Ia. Feb. 12-17
Show, Kansas City, Mo. Feb. 12-17
Show, Watertown, N. Y. Feb. 14-17
Show, Syracuse, N. Y. Feb. 19-24
Show, Duluth, Minn. Feb. 19-24
Show, Des Moines, Ia. Feb. 19-24
Show, Bridgeport, Conn. Feb. 19-24
Show, Pittsfield, Mass. Feb. 19-24
Show, St. Louis, Mo. Feb. 19-24
Show, Brooklyn, N. Y. Feb. 24-Mar. 3
Show, Wilkes-Barre, Penn. Feb. 26-Mar. 3
Show, Omaha, Neb. Feb. 26-March 3
Show, Atlanta, Ga. Feb. 27-Mar. 4
Show, Newark, N. J. Feb.

March.

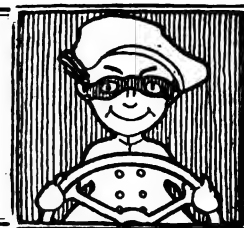
Show, Boston, Mass. March 3-10
Show, Fort Dodge, Ia. March 6-10
Show, New Haven, Conn. Mar. 19-24

April.

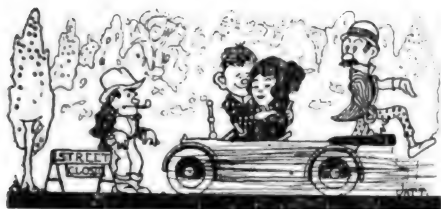
Race (Road), Los Angeles to Salt Lake City. April



Graphic Items



An unusual case in Vermont brings up the question of whether it is judicious and safe to combine the ancient art of courting with the more modern art of



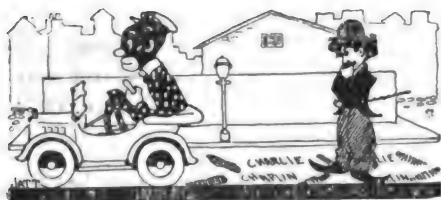
steering an automobile. The driver was manipulating the steering wheel with one hand while the other was encircled about the waist of his fair companion. To make a long story short, the car came to grief against an obstruction alongside of the road and one of the occupants of the rear seats sued the driver for \$295 damages, claiming sundry injuries to both feelings and body. The girl sharing the driver's attention at the time did not, however, bring suit. The defense did not claim jealousy on the part of the plaintiff in the plea for leniency.

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Residents of the west side of New York City who own motor cars are not satisfied with the penalties imposed by law for violation of traffic laws and have formed an organization to penalize themselves for such violations. The organization is called the West Side Automobile Owners' Law and Order League and one of the rules is that any member who is fined for any traffic violation will be obliged to contribute to the league a sum of money equal to half of the amount of his fine. This money will be used in spreading literature and circular letters to owners of automobiles.

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If in the near future you should happen to run across "Charlie Chaplin," printed in the sand or clay of the road way with imprints of his famous pedal extremities, do not become alarmed or apprehensive of immediately accosting the famous movie comedian. Impressions of his autograph on the highways, together with his foot prints, would indicate that one of the Mutual Film Company's service machines has passed over the road. These machines are equipped with specially made tires, which have a



non-skid tread in the form of raised letters, forming Chaplin's name and intervening raised surfaces in replica of Charlie's famous shoes.

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The native dealer in Chevrolet cars at Singapore, India, issues a motor publication called the "Motor Horn," which he circulates about among the distributors of cars in the Far East. As most of these dealers are Mongolians, the paper is naturally unusual in type, having to appeal to a race whose ideals of things are radically different from those held by Americans or Europeans.

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Two college students in Connecticut have just launched a creation which in "distinctiveness, originality and individualistic appointments," as the advertising managers of the auto companies would put it, has a little something on anything that has yet appeared to grace the highways. This 1917 Compleximus is of "two-freshmen power," has the latest dog kennel hood with wash board metal tops. Also the latest in bucket seats, made from halved sections of an old oaken bucket that formerly hung in



some nearby well. As to the bore and stroke, the constituent members of the two-unit power plant say that it hasn't bored any one yet that has seen it, but usually afflicts them with a stroke of apoplexy.

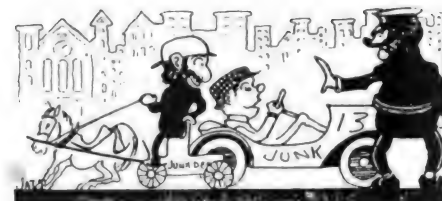
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A large touring car, left standing near the top of Queen street hill in Dorchester, Mass., suddenly started rolling, gaining momentum as it descended the grade until it crashed through a fence and into the piazza of a house at the foot of the slope. The occupants of the house, who were at the supper table at the time, rushed out, fearing a bomb had been exploded in their front yard, but were surprised to find the badly mangled automobile, and more surprised after investigation to not find evidence of a driver.

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A Philadelphian with considerably more "pep" than is usually credited to natives of the sleepy city, "honk-honked" into New York City with a queer looking machine bearing in large numerals the cabalistic number "13" and the words "Junk" painted on the sides, back

and hood of the car. Just as the driver of the machine thought he was making a hit with the frivolous minded habitues of Broadway, a patrolman decided that



it reminded him of his ancestry, or to be outspoken, it was all Dutch to him. He inquired of the driver:

"What is the big idea, feller."

"It's only a joke," said the Philadelphian.

"That ain't no joke," responded the cop, and later proved to his prisoner that if it was the joke was on the latter, as he locked him up for driving a car without a license.

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Whether it is because of there being safety in numbers or the natural inclination toward superstition, the Highway Commission of Massachusetts is at a loss to know why so many people write in and want certain numbers on the registration plates for their automobiles. Out of 200,000 odd registrations in that state, nearly 15,000 have requested certain numbers. But few of these requests can be granted, however, as most of the numbers asked for have been allotted and the officials follow the rule that when a man is renewing his registration he has the option of retaining his old number if desired. The idea has been advanced that the demand for the low numbers comes from social climbers who are under the impression that a low number indicates the ownership of a machine for a long period and therefore bespeaks of the aristocratic. One operator has carried the idea out to the ultimate extreme, having the same number for his car, telephone and residence.

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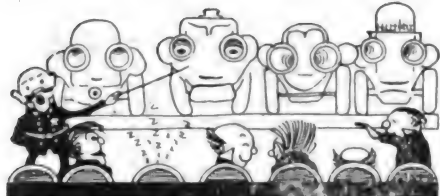
The high price of eggs and the inestimable value of the producers of this product have been much touted in the newspapers of late, but it remained for an Illinois justice to take official cognizance of the hen's standing in the



community. In the case of a nocturnal hen coop visitor who had been convicted of stealing six of his neighbor's hens, he meted out a sentence of 90 days and to emphasize the severity of this crime he imposed on the next man on the blotter, who was up for stealing a Ford, a 60 days' sojourn at the town lockup.

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The police departments in some of the larger cities are conducting bureaus of instruction for patrolmen, where they are taught, in connection with other things, how to identify the different makes of automobiles by a front view the same as they would identify a per-



son by facial features. Diagrams are drawn to show how the set of radiators, lamps, mud guards, truss rods and radiator caps bear resemblance to one type of the human face, while the change in the respective locations of these various parts would give the front of the car a very different appearance.

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A judge of the Central District Court at Worcester, Mass., dealt out some fines and sentences to automobilists in that city that had a sudden effect in restraining the desire of drivers to see how near they could come to some person or object without hitting it. Two men were sentenced to two months in jail, each for reckless driving, while about a dozen more brought before the court on the same charge were fined from \$25 to \$50 and costs each. The campaign is being prosecuted diligently.

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It is a well known fact that the Chinese invented gunpowder and printing—we all read that in our histories. Few people know, however, that the



denizens of the Celestial Empire were the originators of the taxicab and the speedometer. Such is a fact, nevertheless, and it is claimed that way back in 265 A. D. the Orientals rode about in two men-power gigs with an ingenious contrivance attached to the shaft which struck a blow on a board at the end of a certain distance traversed. By counting the number of beats the occupants knew what they were to pay for their ride.

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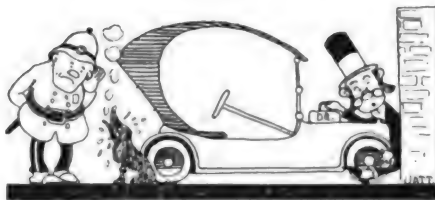
While Henry Ford, Elwood Haynes and a few foreigners contend for the honor of originating the first automobile, information comes from far off Bohemia



that there were prototypes of the modern automobile in use so long ago that if years were miles the modern speed car could not cover the distance between now and eternity. These machines did not exist only in a disordered mind, but were in actual use some time in the Mediaeval Ages for war purposes. Some pictures uncovered in the old Bohemian city of Saaz, on the Eger river, show these machines in use by warriors who were attacking the fortress of Glatz in Silesia. They were built on the lines of a low hung motor truck with large shields in front. The men who propelled the vehicles stood behind these shields and turned cranks, the power being transmitted to the wheels through a set of cog wheels. When exceeding the speed limit to terrorize their foe these fearless "chauffeurs" drove their cars at a rate of as much as four miles an hour.

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James E. Hair, internationally famous as a breeder of dogs, had a hair's breadth



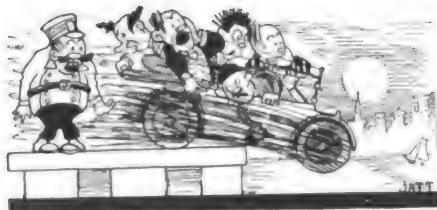
escape from death recently at his home when his motor car, which he was cranking up in the garage, started and pinned him against the rear wall. The force and suddenness of the shock knocked him unconscious, but one of his faithful setters realized his predicament and barked loudly until some of the neighbors came to investigate and extricated Mr. Hair.

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At a meeting of the state highway commission of California, which was attended by representatives of counties and municipalities in that state, it was recommended that a law be introduced at the next session of the Legislature to prohibit automobile road racing on the public highways.

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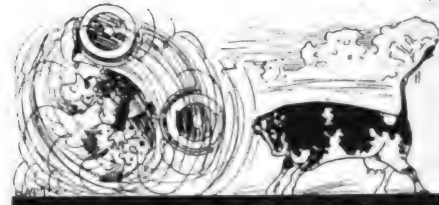
There is a motor car owner in a Boston suburb who has strong convictions in the utterance of the pessimist to the effect that "things get poorer and poorer



and by-and-by they get worse." After mixing considerable joy water with his desires the man in question successfully piloted his machine into the Charles river basin with its five occupants. The entree into river was made at the rate of about 40 miles an hour and, incidentally, came close to causing an officer of the law to do some plain and fancy diving. The officer, however, forgot for a moment his narrow escape and rescued the joyless joy riders. He later arrested two of the number for fracturing a series of the traffic ordinances.

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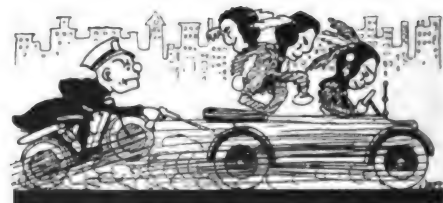
A party of automobilists returning



from Groton, Conn., to Mystic in that state, recently experienced the novel sensation of being literally upset by a belligerent cow. The driver of the car, like many others, was under the impression that belligerency in the bovine family was confined to the male sex, so when a cow appeared in the road he felt no alarm until the animal bolted toward the machine. The next thing he and his companions knew they were straightening themselves out in a ditch. The exterior of the machine suffered much more damage than bossy's head.

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It seems that the possession of an automobile has the same effect upon mankind, regardless of his color, creed or nationality. Out West, where Indians have recently received large sums of money derived from the sale of their lands, they have been investing in speedy motor cars and it is not uncommon to see an old warrior, who formally decorated the entrance to his tepee for hours at a time without moving, scorching over the roadways at "bett'n the law allows."



Unlike their white brothers, however, when taken to court they do not bewail their fate, but wonder why such exhilarating sensations should be restricted.

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The Du Pont Company, Wilmington, Del., has had a film made showing the advantages of good roads in a community. It is planned to exhibit it at meetings of farmers, road builders, automobile associations and other gatherings when it can best be seen by those most directly interested in roads. The film not only shows the latest up-to-date road building methods, but also the results of poorly constructed roadways.

**PROVING ALIGNMENT.**

(Figure 281.)

When replacing a connecting rod after overhauling the car it is important that the parallelism of the wrist pin and crankshaft be preserved. If the connecting rod is being fitted with the engine in the frame the parallelism can be determined by the method shown in sketch. The top of a crank case is generally planed true and it is assumed that the wrist pin is parallel with the top of the case. With the piston in place on the rod to be tested, the truth of the fitting can be proved easily by the use of a steel square, as shown in sketch. If the piston side is at right angles with the top of the case, it is reasonable to assume that the wrist pin and crank pin are parallel. If it is canted to one side, it would prove that the crank pin bearing had been scraped too much at one side, or that the shims between the cap and connecting rod had not been fitted squarely. In that case heating and undue friction because of piston pressure against cylinder wall would be the result.

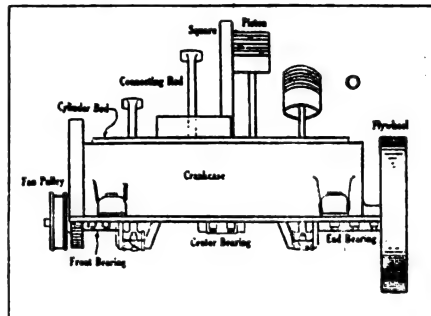


Fig. 281—Testing for Parallelism.

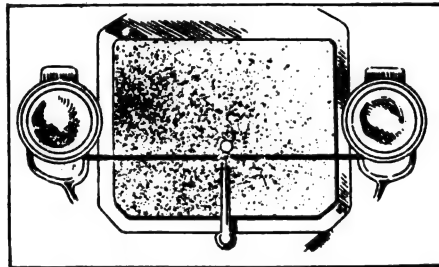


Fig. 282—Novel Crank Holder.

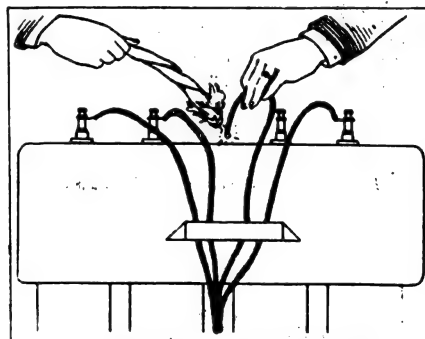


Fig. 283—Securing Light.

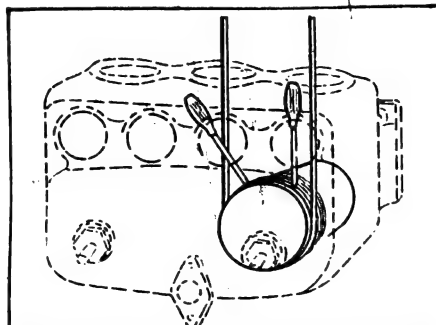


Fig. 284—Displaced Piston Ring.

DAZZLING HEADLIGHTS.

(Figure 286.)

Since nearly all states and cities have adopted regulations regarding the prevention of glaring rays from headlights, many motorists of a mechanical bent of mind have sought to adjust their lights or to devise means to control the rays so that they will conform to the laws. One reader, P. F. B., Connecticut, writes about how he has overcome the glare to his own satisfaction, and to pass along the information for what it is worth to others. He sent a sketch to illustrate the idea, and this is reproduced on this page. His method consists of tilting the lamp brackets as shown in sketch, the amount of adjustment being determined to suit varying conditions. He did this by means of two monkey wrenches to bend the brackets, taking care that the bending was done gradually to prevent the cold iron from breaking or cracking under a sudden strain. By tilting the brackets the brilliant rays of the light are cast at a sharper angle in front of the car without forfeiting much of the volume of the light. This subscriber also tells about how one of his neighbors coats the lens with a transparent paint or with a thin film of moistened soap on the inside of the lens so that it will not be rubbed off.

NOVEL CRANK HOLDER.

(Figure 282.)

The starting crank handle should not be allowed to swing idly, as its bearing is subjected to unnecessary wear, which in time will cause annoying rattle. The method of holding the handle shown in our illustration has been found serviceable on a model T Ford car. A strip of round rubber or cable was attached to the headlight brackets as illustrated and was secured so that when the starting handle was in vertical position there was sufficient tension to hold it tightly. The rubber was covered with braid to protect it from the elements and to add to the appearance of the device.

DISPLACED PISTON RINGS.

(Figure 284.)

The illustration and story of how a subscriber replaced a displaced piston ring is shown here for the benefit of other readers who at some time may meet with the same experience. The reader submitting the idea requests that his name be kept from publication. He decided to install a new set of cylinders and ordered them from the factory. During transit, or perhaps in the factory itself, the pistons slipped upward until their heads came in contact with the top wall of the combustion chamber. Naturally the top ring expanded and when it was attempted to remove the pistons it was found the rings had been caught.

Limited space prevented the insertion of any ordinary type of clamp to compress the ring. By making a thin strip of metal of approximately the same width as the piston ring and passing it through the valve plug openings, it was a simple matter to locate the band in the desired position, that is, diametrically opposite the ring slot. One person drew the band taut and exerted an upward pull, which forced the ring onto its seat or groove on the piston. Another person compressed the rings as shown in the sketch, using a pair of screw drivers for the purpose. In this way a three-point compressional effect was obtained, and it was a simple matter to withdraw the piston back into the cylinder proper. Before beginning the work the ring was worked around so that the slot was on the top, or between the points at which the screw drivers were to be placed.

REMOVING FLYWHEELS.

(Figure 285.)

When it is desired to remove an engine flywheel that is secured by means of a gib key, which has been general practise in older models of light cars, the suggestion illustrated in the accompanying sketch will be found convenient and practical. The sketch is self explanatory.

CARBURETOR TROUBLES.

If you are troubled by backfiring through the carburetor, which may be due to late ignition of a weak mixture, try the following suggestion: Place a flared cone of very fine wire gauze of 50 or 60 mesh in the suction pipe between the ends of the pipe and carburetor with a soft gasket to prevent any leakage. This will not only stop backfiring, because flame even under pressure will not pass through a very fine screen, but will result in much better engine service as well as fuel economy.

COTTER PIN SPREADER.

(Figure 287.)

An ordinary pair of slip joint pliers can be utilized for securing cotter pins in place. As these pliers are inexpensive, one can well afford to devote a pair to some particular use, hence the following suggestion: As shown in the illustration a small piece of metal is welded onto one of the jaws, as at A, and then ground to shape and size, as shown, so as to enter between the split ends of the cotter and spread and roll them over when pressure is exerted. A round recess is bored in the face of the other jaw to hold the head of the cotter pin. The illustration shows the use of the tool, which will also be found handy in extracting pins, by clamping the eye of the cotter between the recesses of one jaw and the wedge of the other and pulling sharply.

J. M. G.'S SUGGESTION.

(Figure 283.)

One of our oldest readers sends in the following suggestion for the benefit of other subscribers, stating that he has frequently had occasion to resort to the method while out at night. The suggestion concerns a simple way to obtain a flame with which to light oil and acetylene lights on a car when one is without matches and it is dangerous to proceed without illumination. J. M. G. suggests that under those circumstances a motorist should remove a cable from one of the spark plugs and start the engine. Next roll a piece of paper so as to form a sort of wick and dip one end of it into the gasoline in the tank. By holding the terminal of the spark plug cable close to any metal part of the engine a spark is made to leap the gap and if the gasoline soaked end of the paper wick is placed in the path of the arc it will become ignited. We would suggest that extreme care be taken to remove the paper wick instantly after it is ignited from the vicinity of the engine.

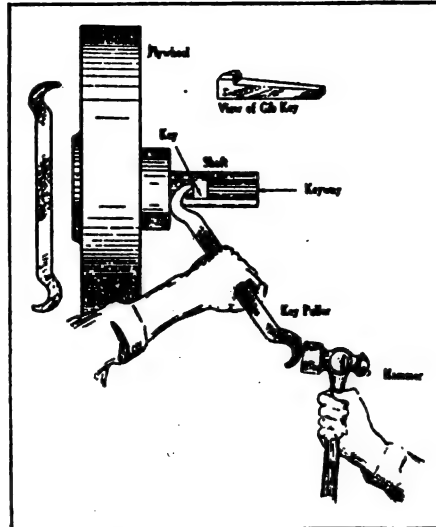


Fig. 285—Removing a Flywheel.

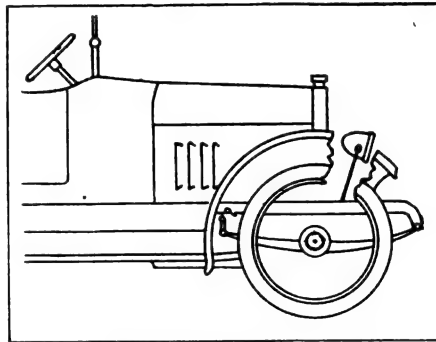


Fig. 286—Dazzling Headlights.

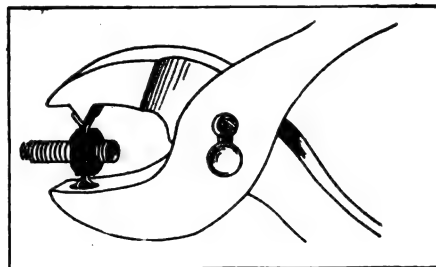


Fig. 287—Cotter Pin Spreader.

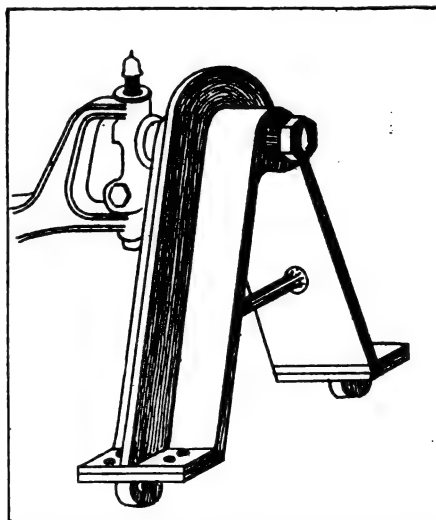


Fig. 288—Portable Garage Stand.

PORTABLE STAND.

(Figure 288.)

When working on a car at a job that requires removal of a wheel and the use of a jack for support and it is desired to move the car into another position, it will be found that the procedure is bothersome and time consuming. The device shown on this page is intended to make such work easy and simple, it consisting of a non-adjustable support on rollers. It is made of a piece of T shaped angle iron bent as shown. On the under side of the bend a piece of pipe is welded in place, the pipe being of a size that will just fit over the axle spindle and leave room for the nut to be screwed into place. A brace, for the sake of obtaining rigidity when the weight of the car is on the support, should be placed about half way from the base and between the two arms. Any old piece of old metal stock will do. Swivel casters, preferably No. 937 roller bearing type, should be secured by bolts to the feet of the stand. This kind of caster is inexpensive and turns in any direction. Such a device as this will be found to be very convenient when one does much repair or overhaul work in the garage, or in the case of a large garage where several cars are kept.

CLEANING MACHINE PARTS.

At this season of the year a large number of motor cars are laid up in the garage, though not so many as in former years, and the owners seize the opportunity to overhaul their cars for spring operation. One of the tasks in such work concerns the cleaning of parts of the mechanism that have become covered with dirt and grease. A satisfactory way to do this without having recourse to the use of benzine or benzol is to boil the parts in soda lye. After removing the parts from the bath brush them thoroughly before they become cooled and then rinse in hot water. Cautic soda is understood to be better than the ordinary kind, because it dissolves grease and fat quicker. To dry the parts it is generally necessary only to allow the drops of water remaining to evaporate.

GASOLINE FIRES.

If you are so unfortunate as to be the victim of a gasoline fire in your garage, or anywhere else for that matter, remember that gasoline does not mix with water, and consequently water should never be used to extinguish such a fire. If a patent fire extinguisher is not at hand throw sand on the blaze, or use sawdust. The latter is not easily ignited and when it does burn there is no blaze of any consequence.

RESTORING BRASS FINISH.

Apply a mixture of vinegar and salt, or oxalic acid, to brass that needs cleaning, and then wash with luke warm water and polish with any good commercial brass polish.



The New Plant of the Apperson Bros. Co., Kokomo, Ind., Which Provides Ample Room for Future Expansion.

The Business Side of the Motor Industry

The General Motors Corp. of Delaware in a report to the New York Stock Exchange gave the balance sheet as of Dec. 9 as follows:

ASSETS.	
91,664 shares preferred General Motors, N. J.....	\$12,221,867
90,628.25 shares common General Motors, N. J.....	45,314,137
Cash in bank	3,528
Organization expenses	11,427
Totals.....	\$57,551,004
LIABILITIES.	
Preferred stock authorized.....	\$20,000,000
Less amount to be issued in exchange for preferred stock...	7,804,000
General Motors of N. J.....	\$12,196,000
Preferred stock outstanding.....	
Common stock authorized.....	\$2,600,000
Less amount to be exchanged for General Motors of N. J..	37,285,900
Common outstanding	\$45,214,100
Bills payable	15,000
Accounts payable	25,904
Totals.....	\$57,551,004

Of the \$45,314,100 common stock outstanding the Chevrolet Motor Co. holds \$16,644,500 in one certificate. It is understood that the Chevrolet Motor Co. agrees that this stock will be kept in the treasury and that none of the shares will be sold without first publishing a notice of its intention to do so at least 60 days in advance.

The Velie Motors Corp., which was recently organized with \$2,000,000 capital to take over the Velie Motor Vehicle Co. and Velie Engineering Co., Moline, Ill., is owned and controlled by the same men that were chiefly interested in the latter two companies and the Velie Carriage Co. The status of the carriage company has not been changed by the merger of the other two companies, it containing operations as an individual concern. The increased capitalization of the Velie Motors Corp. as compared to the combined capital of the two companies of which it is a merger, was

taken care of entirely from the accumulated profits of the companies. No change has been made in the personnel of the directorate and the stockholders in the Velie Motors Corp. are the same as in the two individual companies before they were merged. The directors are: W. L. Velie, S. H. Velie, F. R. Todd, C. B. Rose, F. E. Bradfield, O. E. Mansur and D. E. Nutt.

The Apperson Bros. Automobile Co., Kokomo, Ind., has practically completed its new and modern factory upon which it has been working for the past year and will soon be ready for production for the 1917 season. The old buildings will be retained, but the bulk of the manufacturing operations will be conducted in the new plant, which was especially designed and arranged for the production of automobiles. Modern machinery has been installed to complete the equipment wherever necessary to bring the whole plant up to the highest state of



The Men Who Inspected the Joy Aviation Field, Detroit—From Left to Right: W. H. Hutton, Henry B. Joy, Chas. B. King, Dr. H. C. Dickinson, Bureau of Standards; Lieut.-Col. Geo. O. Squier, in Charge of Aviation; Eugene Lewis, Dr. W. Stratton, Director of Bureau of Standards; Henry Souther, Consulting Engineer, U. S. A.; Dr. Chas. F. Marvin, Chief of Weather Bureau; Howard E. Coffin, Sydney D. Waldon, Lieut. W. G. Child, U. S. N.; Roy D. Chaplin, Dr. Chas. D. Walcott, Secretary Smithsonian Institute; Russell Huff.

efficiency. The complete plan of the new plant was worked out by Elmer Apperson, president and general manager. With the addition of these new buildings the total acreage of the Apperson plant has increased until the working space aggregates over 1,000,000 square feet.

The General Motors Co. will build extensions to its plant at Flint, Mich., and will also increase the production facilities for the Weston-Mott Co. and the Cadillac Co., subsidiaries. The output of General Motors for 1917 is scheduled at 200,000 cars, of which the Buick company will manufacture 125,000. On Dec. 11 cash on hand totaled \$22,850,318, as compared with \$12,652,662 a year ago. During the first 11 days in December the receipts totaled \$6,700,000, as compared with less than \$5,000,000 in the same period of 1915.

The Studebaker Corp. for the fiscal year ending Dec. 31 is expected to show profit of from \$10,500,000 to \$10,800,000, or about 33 per cent. on the \$30,000,000 common stock of the company after allowing \$800,000 for the preferred dividend. As the company is well covered for raw materials for 1917 and is assured of the sale of its product of close

The Locomobile Company of America, Bridgeport, Conn., is planning the erection of additional factory buildings to provide for the increase of production facilities. It is understood that about 20,000 additional square feet of floor space is required by the company in its manufacturing plant.

The Corcoran Manufacturing Co., Cincinnati, O., manufacturer of automobile bodies, fenders, hoods and radiators, has purchased the plans of the Jacob Freund Roofing Co., and the Cincinnati Tile and Terra Cotta Co. A fireproof building, four stories in height, 472x76 feet, will be erected for the exclusive manufacture of bodies.

The J. P. Gordon Co., Columbus, O., which has made two large additions to its plant during the past year, with an active working floor space of 100,000 square feet, has been obliged to put on a night shift of over 200 power sewing machine operators and will add to this number as rapidly as help can be secured. The company manufactures seat covers, tire covers, top covers, radiator and engine robes.

The Packard Motor Car Company, Detroit, Mich., through its chairman, Henry

of the "Regal Dealer," which contains a story with illustrations of the early models made by the company and the service they have rendered their owners. The picture of the first car made in 1907 makes an odd contrast with the illustration of the new Regal 4-thirty-two, which are shown side by side.

The Pyrene Mfg. Co., New York, N. Y., has sent notices to stockholders of a meeting to be held Jan. 2 for the purpose of acting on a proposed increase in capital from \$1,050,000 to \$3,050,000. The new capitalization will be divided into 300,000 shares of common and 5000 shares of preferred, both classes being of \$10 par value.

The Brunswick-Balke-Collender Co., Muskegon, Mich., expects to be producing the new Brunswick tires and tubes at the rate of 500 a day by Jan. 15. The company will also manufacture rubber accessories.

The Globe Tire Co., LaPorte, Ind., has purchased the plant of the H. B. Glover Co. in that city and will manufacture semi-solid rubber tires and inner tubes. A. A. Peterson, the superintendent of the plant, says that production will commence about March 1. Mr. Peterson was



The New Home of the Grant Motor Car Corporation in Cleveland.

to 80,000 cars, which will be the schedule for the year, the next 12 months are expected to even eclipse the record earnings of the year just drawing to a close.

The Kelly-Springfield Tire Company for the year to end Dec. 31 will show estimated total earnings of 40 per cent. and possibly 50 per cent. on the \$5,000,000 common stock as compared with 29.67 per cent. earned in 1915. When the new plant for the concern is completed at Cumberland, Md., which will enable the company to increase its output 400 per cent. if necessary, much greater earnings are looked for.

The Rubber Club of America, Inc., will hold its 17th annual banquet in the Waldorf-Astoria hotel in New York City on Monday evening, Jan. 8. The speakers will be Ex-President Taft, Frank A. Vanderlip, president of the City National Bank, and Bishop Frank De Moulin of Ohio. The annual meeting and election of the club will be held in the afternoon on that date. A very enthusiastic meeting is anticipated, as the past year in the rubber industry has been the greatest in its history, it being estimated that the factory output of the country will reach \$600,000,000.

B. Joy, of the board of directors, recently had the representatives of the U. S. Army and Navy, government and officials and engineering scientists make a tour of inspection of the Joy aviation field on the Michigan shores of Lake St. Clair. The field is a level expanse of 570 acres and being on the shores of the lake affords an excellent opportunity for both flights over land and water with aeroplanes and hydroplanes.

The Studebaker Corp., South Bend, Ind., is not interested, either directly or indirectly, in the International India Rubber Co. of the same city, according to official announcement. It is also stated by the officials that none of the Studebakers connected with the automobile company have any interest in the tire company or are interested in any way in the promotion of the company. The impression was gained that the automobile concern was interested in the new tire company owing to the connection of Peter E. Studebaker with the latter concern. Mr. Studebaker resides in Cincinnati and has no interest in the Studebaker Corp.

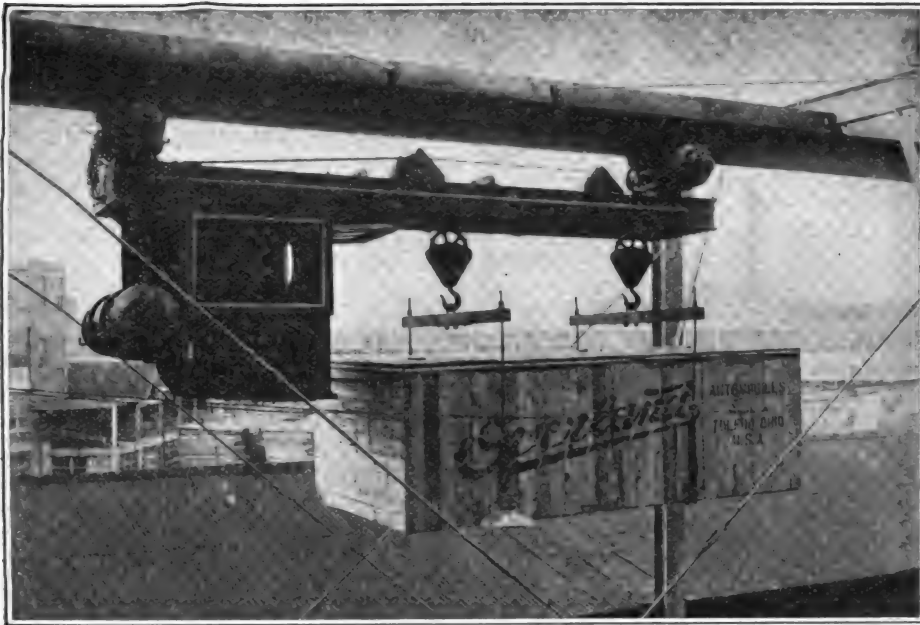
The Regal Motor Car Co., Detroit, Mich., has issued its Christmas number

formerly superintendent of the Fisk Rubber Co.'s plant.

The Standard Parts Co., Cleveland, O., has sent a check for \$1,010,000 to the Perlman Rim Corp. as payment for back royalties. This payment is the outcome of the suit brought by L. H. Perlman, inventor of the demountable rim, against the Standard Welding Co., claiming royalties from the latter concern for use of his patent. Since the suit was started the Standard Welding Co. has been merged into the Standard Parts Co., together with the Perfection Spring Co.

The Maxwell Motor Co., Detroit, Mich., has announced the resignation of Eugene Meyer, Jr., from the company's directorate. Mr. Meyer, who is the head of the Eugene Meyer, Jr. & Co., stock brokers, has been interested in the Maxwell company since it was started. His successor on the Maxwell directorate will be elected at the next meeting of the directors.

The Buick Motor Co., Flint, Mich., will increase the volume of production from 550 cars, the present daily output, to 750 cars. An expenditure of \$1,900,000 has been authorized to provide facilities for this increased production.



The Willys-Overland Company Uses a Three-Ton Travelling Crane to Convey Packed Overlands for Export Shipment to the Shipping Departments. This Makes the Handling Easier, Safer and Speedier.

The Reo Motor Car Co., Lansing, Mich., at a meeting of the stockholders on Dec. 19 re-elected the old board of officers and board of directors.

The Metz Co., Waltham, Mass., has announced a high-duty one-ton truck with a 130-inch wheelbase which will sell for \$695. The ½-ton delivery car, which sells for \$500 to \$600, will be continued.

The King Motor Car Co., Detroit, Mich., announces that the seven-passenger and four-passenger touring cars and the three-passenger roadster have been advanced in price from \$1400 to \$1585, an advance of \$185. The price of the King seven-passenger sedan has been advanced to \$2150.

The Dixie Motor Car Co., Louisville, Ky., has filed amended articles of incorporation providing for an increase in its capital stock from \$150,000 to \$400,000, to be divided into shares of a par value of \$100 each, one-half to be common stock and one-half preferred stock. The limit of indebtedness is fixed not to exceed \$1,000,000.

The Ford Motor Co.'s plant at Detroit, Mich., was closed for seven working days during the week preceding Christmas as a means of relieving the car shortage throughout the country. The suspension resulted in a production loss of 17,500 cars and a wage loss to the employees of \$1,400,000.

The Pierce-Arrow Motor Co. has declared an initial dividend on the preferred stock for the period from Dec. 6, the date of the preferred stock issue, to and including Dec. 31. The payment is at the rate of eight per cent. per annum.

The Paige-Detroit Motor Car Co.'s issue of \$1,000,000 seven per cent. cumulative serial preferred stock, which was recently offered by an underwriter, was several times oversubscribed and the books have been closed. The stock will be redeemed at the rate of \$100,000 par value each year from Jan. 1, 1918, to Jan. 1, 1927. The company's earnings

for the 10 months ending Oct. 31, 1916, were \$964,442.

The Allen Motor Co., Fostoria, O., will discontinue production of the \$795 standard touring car and roadster after Jan. 10 and will confine its line to the specially finished Allen Classic touring car and roadsters, which will sell for \$850. This action was taken so that the company would be in a position to meet the demand for the Classic models, which at present constitute over 80 per cent. of the Allen output.

The Reo Motor Car Co.'s employees have been operating on a co-operative plan in securing potatoes and canned stuff for their personal use and the experiment has been so satisfactory that plans are now being discussed for establishing a co-operative general store and coal yard.

The Firestone Tire and Rubber Company, Akron, O., has under construction another new building and is adding another story to its main factory buildings, preparatory to increasing its output to 20,000 pneumatic tires a day. The structure will house all repair and mechanical departments. It contains approximately 86,000 square feet of floor space and is to be built of reinforced concrete and brick with large steel sash windows. Upon its completion the total factory floor space will be about 40 acres.

The Buick Motor Co., Detroit, Mich., has announced a new list of prices for all models, as follows: D-4-34, \$660; D-4-35, \$675; D-6-44, \$1040; D-6-45, \$1070; D-6-46, \$1440; D-6-47, \$1835.

The Maxwell Motor Co., Detroit, Mich., has announced a new price list on touring and roadster models, which becomes effective on the first of the year. The new list is as follows: Touring car, \$635; roadster, \$620.

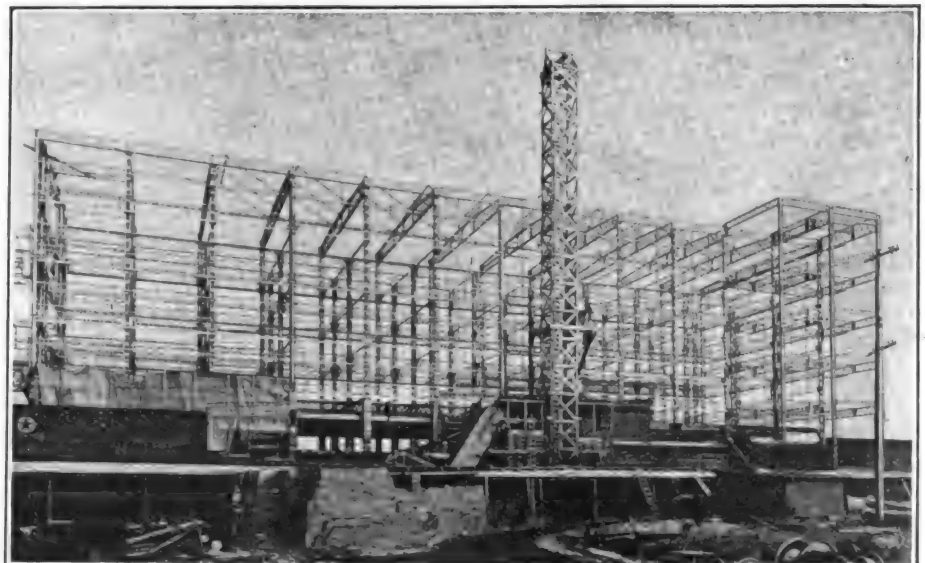
The Franklin Automobile Co., Syracuse, N. Y., will raise the price of all models \$100, the new list of prices to become effective March 1.

The Paige-Detroit Motor Car Co., Detroit, Mich., announces the following new schedule of prices: Model 51 Stratford, seven-passenger touring car, \$1495; model 51 Brooklands, convertible roadster, \$1695; model 39 Linwood, five-passenger touring car, \$1175; model 30 Dartmore roadster, \$1175. Closed car prices are unchanged.

The Auburn Automobile Co., Auburn, Ind., has announced an increase in the price of the five-passenger light six of \$60, which will become effective on the first of the new year.

The Regal Motor Car Co., Detroit, Mich., has announced through President Fred W. Haines, an increase of prices for its 1917 models, the price being \$745 instead of the former \$695.

The Simplex Automobile Co., New York, N. Y., has increased its capitalization from \$5,000,000 to \$9,000,000.



Firestone is Adding Another Building to Its Plant.

New Code of Laws in R. I.

Almost Unlimited Powers Placed in State Board of Public Roads.

The new auto law that goes into effect in Rhode Island on the first of the year, 1917, contains many provisions of a sweeping character as compared with the old statutes.

The new law gives the State Board of Public Roads almost unlimited powers in the regulation of the motor vehicle traffic throughout the state, and its acts are only subject to review by the Superior or Supreme courts. Hereafter an appeal from a decision of the board will not act as a stay of execution of any order by the board. An appeal must be taken within 10 days to the Superior Court of Providence and Bristol counties, setting forth the grounds of the appeal. The court shall cause a 30-day notice of the pendency of such a petition after it is filed and the decision of the board shall stand during such pendency and until changed by the court.

Power is also given the board to dictate the kind and character of a motor vehicle that a person may operate, and it may determine that a person can operate one kind of a car, but not another.

Every court in the state is required to keep a full report of every case in which a person is charged with a violation of the motor vehicles laws, and within 10 days after the case is disposed of shall send an abstract of the case to the State Board of Public Roads. Operators of motor vehicles that participate in any accident where a person is hurt are also required to report the accident at once to the board.

The board is also authorized to appoint investigators and examiners with the power of constables who may make an arrest without a warrant and without giving surety for costs or becoming liable for costs under any complaint.

The board also exercises discretionary powers in cases where any person whose license has been revoked neglects or refuses to surrender it to the board and can disqualify the holder from receiving another license.

The law requires every driver who knowingly figures in an accident to give any officer or person interested the names and addresses of every occupant of his car. It also becomes illegal to drive past a trolley car on the side open to receive or discharge passengers while such car is standing for such purpose. It is also unlawful for a person under the age of 16 years to operate a car.

During the period from one-half hour after sunset until half an hour before sunrise every car must display two white lights in front and one red and white light in the rear, and the latter light must be so attached and arranged as to illuminate the rear number plate as to make it plainly visible at a distance of 60 feet. The front lights must be visi-

ble at not less than 200 feet in the direction toward which the car is proceeding.

Every motor car of over 10 horsepower must be fitted with at least two powerful brakes, wholly independent of each other, each of which shall be of sufficient power to stop the automobile or motor truck within a proper distance.

The new registration provisions in the law provide that all licenses will expire on Dec. 31 of each year. Cars registered before April will pay the full fee, but after that date the fee will be based on the time intervening between the date the license is taken out and the expiration date. Motor trucks, however, may be licensed for three, six, nine months or a year, and the fee will be in proportion to the period for which the vehicle is licensed. The number plates which must be carried both in front and rear of the car must be attached in a horizontal position and not more nor less than 48 inches from the ground.

The law governing the use of number plates on motorcycles does not become effective until Jan. 1, 1918.

WILL HAVE USED CAR AUCTION IN LOWELL.

The automobile dealers of Lowell, Mass., are planning an exhibition of second hand automobiles, which will be held in the Kasino in that city during January. It is proposed to hold an auction, similar to those recently held in Worcester and Springfield, Mass., at which the dealers practically cleaned up their stocks of second hand cars which had been taken in trades.

A special date will be announced for the auction and it will be advertised throughout the county.

MOTOR CAR EXHIBITORS AT 1917 AUTO SALON.

Seventeen exhibitors will have cars on display at the 13th annual Automobile Salon to be held in the grand ball room of the Astor, New York, from Jan. 2 to 10. The big balcony of the Astor's famous grand ball room will be used for the first time this year to display the overflow of de luxe motor cars.

The Locomobile Company of America will exhibit this year for the first time and will continue the custom hereafter, joining the White company, which entered the list of salon exhibitors last year, and the Simplex company, which first showed its new models in the Astor three years ago. The Navara is another new car at the salon and, incidentally, it is the first time that the car has been displayed in public. The other exhibitors at the Automobile Salon are: Brew-

ster, Daniels, Isotta-Franchini, Lancia, Murray, Phianna, Rolls-Royce, Singer, S-S-E.

There will also be an exhibit by custom body builders, including Brewster, Holbrook, Locke and Rubay. Many of the foreign makes that were formerly annual features at the salon have been withdrawn, as the companies manufacturing them have been commandeered by the governments of Europe to produce ammunition and other equipment for the military operations. England and Italy are the only two countries represented in this year's list.

GEN. NICHOLAS HERKIMER MEMORIAL ROAD.

In the Mohawk Valley of New York there is a rising sentiment in favor of officially designating certain roads by the names of distinguished men formerly interested in them or in the district traversed by them. It is proposed to call a certain section of the New York state highways running through the Mohawk Valley, the General Nicholas Herkimer Memorial Road, in honor of the famous Colonial soldier of that name, who was identified with all the country's military operations in the 18th century, including the Revolutionary War, in which he served as a brigadier general. He lost his life in the service, being mortally wounded during the battle in which his command engaged the forces of Sir John Johnson, when Fort Stanwix was threatened by a combined force of Indians, Tories and British regulars.

OLDSMOBILE WINS NEW JERSEY ENDURANCE RUN.

Q. H. Ball of New York City, driving an Oldsmobile Eight, won the annual 24-hour endurance run of the New Jersey Automobile Club with a perfect score. The run was for 447 miles.

The winning Oldsmobile is the second car of that make to establish a perfect score in the contest and is in line to win the Shanley trophy, which was offered nearly 10 years ago for the car that made three perfect scores. Another Oldsmobile, driven by C. B. Wyckoff of Newark, N. J., finished in fourth position with only five demerits, which were charged up against the car when the motor stalled on account of water in the gasoline.

DETROIT AUTO CLUB ISSUES INVITATIONS.

The Detroit Automobile Club of Michigan has sent out invitations to all the other automobile clubs in the country, inviting their members to visit the club headquarters in the Hotel Pontchartrain, Detroit. Complete road maps, route, hotel and other data of interest to motorists is kept for distribution to members and friends of other organizations visiting the automobile city.



NEW M. & E. GREASE CUPS.

One of the best known and widely used standard grease cups on the market today is the M. & E. Ratchet Top cup. It has an interior coil spring engaging in radial corrugations of the top, or cap, and is claimed to be short, clean and very efficient. Recently the maker announced the introduction of a new M. & E. cup, which is claimed to be much improved over the old type. It has a more pleasing design, slightly more grease capacity, better threads, longer and straighter shank and a much improved finish. The new cup, with special finish, is said to possess rust resisting qualities to a much greater extent than the ordinary plain or rough steel cup. The special finish resembles nickel in appearance and lustre and has no coating to peel. It can be kept in prime condition by a slight rubbing with an oily rag. There is no additional charge for the special finish.

Manufactured by the Merchant & Evans Company, 2019 Washington avenue, Philadelphia, Penn., which also makes Hele-Shaw clutches, Evans alignment joint and Evans universal joint. Write for prices.

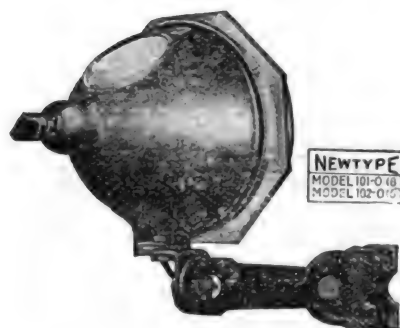
BARRETT MOTOR STARTER.

The outstanding features of the Barrett starter for Ford cars, aside from the fact that it is simple in construction, easy to operate and easily installed, are that there are no pulleys, cables or chains in its construction to break, stretch or kink. In the matter of installation it is not necessary to bore holes, nor to remove the original crank. The starter is completely out of sight, and it is made to meet and withstand all shocks and strains. Should the engine backfire, the starter is automatically released, before damage is done. It is operated from the driver's seat and the leverage is direct and the pull easy. The working parts of the apparatus do not contact with any moving part of the engine, and consequently there can be no wear, which insures it will last as long as the car. Any one can install the starter.

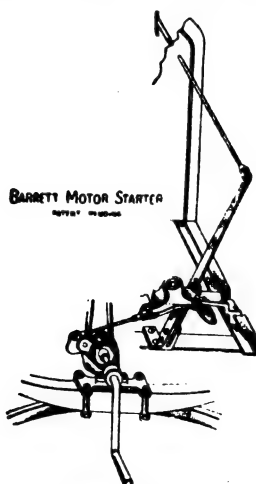
Distributed by the Pioneer Sales Corporation, 1777 Broadway, New York City. List price, \$12. Write for detailed description and liberal trade discount proposition.



New M. & E. Grease Cups.



Woods Octagonal Spotlight.



Barrett Motor Starter.



Quick-Acting Vulcanizer.

WOODS' NEW OCTAGON LAMP.

A new octagon spotlight that is different from other types on the market is shown in our illustration. It is the Woods lamp and is very attractive in appearance and durable in service. One feature is the method of carrying the rear vision mirror built into the body of the lamp, a method covered by patent. Another feature is that the interchangeable gripping clamps are built separate from the main arm of the bracket, which allows the dealer to carry an extra pair of clamps instead of carrying a double stock of complete lamps. The body and handle of the lamps are made from one piece of steel and the switch is built integral with handle. The bracket is electrically welded to the body. The reflector is recessed to take lens and by means of a large open coil spring the reflector and lens are held firmly against a heavy braided packing carried in the roll of the door. The lamp is made in two sizes, six and eight inches, the former being equipped with 21 candle power nitrogen bulb and the latter with a 36-inch bulb. Tests have shown that the first mentioned bulb when focussed in the Woods parabolic reflector gives approximately 7000 candle power, while the larger size gives 12,000 candle power when projected on a screen 15 metres, or 57.5 feet distant, according to the maker.

Made by the Woods Manufacturing Company, Fairfield, Conn. Price of six-inch lamp, \$9; eight-inch, \$12.

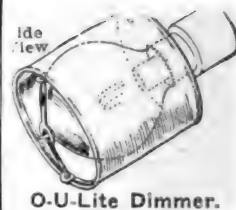
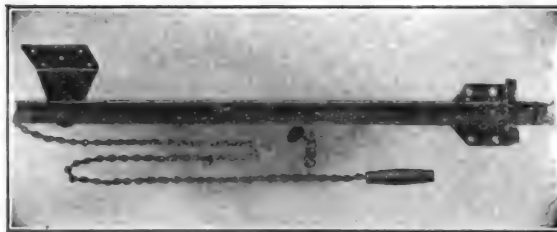
THERMO ELECTRIC VULCANIZER.

The Vulco thermo electric vulcanizer derives its heat from any six to 18 volt storage battery or from a Ford magneto. Thermostats within the device cut out the current the instant the exact vulcanizing heat is reached. To use, simply clamp on tube, throw in switch and when the curing temperature is attained the device is automatically disconnected. The maker claims a vulcanizing job can be done in five minutes at an average cost of five cents.

Manufactured by the V Air and Manufacturing Company, 1648 Tremont street, Denver, Col. Retail price, complete, \$2.50; 12 prepared patches, 50 cents.

"X" RADIATOR LIQUID.

"X" Radiator Liquid is a scientifically prepared substance that when simply poured into the radiator will almost in-



stantly seal a leak, and do it permanently. Not only is this method quick and economical, but radiator manufacturers declare that the liquid, unlike solder, does not injure the delicate honeycomb fabric of the radiator.

"X" Radiator Liquid does not contain glue, shellac, cement, meal or other compound that solidifies, yet it acts as a preventative, eliminates scale and rust and keeps the cooling system clean. "X" Liquid acts when it comes in contact with air, but will remain always as a part of the water in a liquid state, flowing through the radiator and pump as freely as the water itself. When once it has closed a leak, no amount of vibration can dislodge it, which fact has been proved in the two years it has been tested. "X" Radiator Liquid is guaranteed by a thoroughly reliable firm and being backed by an extensive advertising campaign, which introduces an attractive offer to dealers in a new display stand with an extra allotment of cans, giving dealers an extra profit on an assortment of a dozen and a half of the cans. "X" Liquid will be shown at the New York and Chicago shows.

Manufactured by the "X" Laboratories, 630 Washington street, Boston, Mass. Sold in two size cans, small size for Fords and other small cars, price 75 cents; large size that will repair radiators up to 25 gallon capacities, \$1.50.

O-U-LITE DIMMERS.

These are designed for use on automobile headlights, motorcycles, launches, aeroplanes, street cars, etc., and, in fact, anywhere that it may be desirable to have a light that is sharp and piercing or soft and mellow. They are made to be permanent or adjusted at will. The cut shows the permanent type. The device consists of a specially treated translucent or opaque circular shield or mantel, which is arranged to interpose between the bulb and the reflector. It is connected to the reflector and by means

Stanley Garage Door Holder.

of a small wire to a small handle on the steering column. A slight movement of this handle moves the shield back and thus gives the full benefit of the light of the globe. A reverse motion replaces the mantel over the globe and gives the dimming effect.

Made by the O-U-Lite Company, Racine, Wis. Price, 90 cents to \$4.

CASSCO TIRE PUMP.

This is an engine driven tire pump which at present can be obtained for certain models of Buick, Chandler, Chevrolet, Dodge, Ford, Hudson, Hupmobile,

ing rods are of steel. The piston rings are of soft spring steel pressed and ground to size, each piston having three rings. There are intake and exhaust valves of the poppet type, the intake valve being automatic in action. The bore of $2\frac{1}{4}$ inches and the stroke of one inch gives a displacement of five cubic inches. Each pump is completely furnished with all the necessary parts, as well as printed and illustrated instructions as to how to install it.

Made by the G. Piel Company. Distributed by the Edward A. Cassidy Company, Inc., 30 East 42nd street, New York, N. Y. Price, \$8.

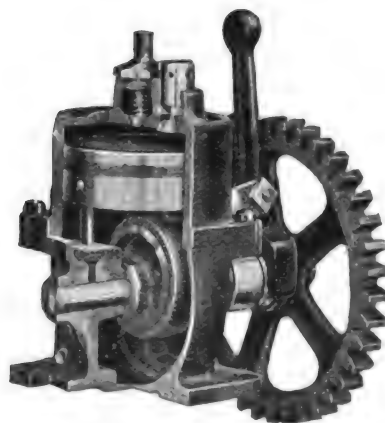
MAY'S COTTER PIN PULLER.

This tool is specially designed to enable a workman to pull out any cotter pin, of any size or angle, regardless of its inaccessibility or how badly it is bent. It straightens the pin automatically and prevents it being dropped into the mechanism. It is highly machined and nickeled.

Manufactured by the May's Cotter Pin Puller Company, 19 Peachtree street, Atlanta, Ga. Retail price, \$1.25.

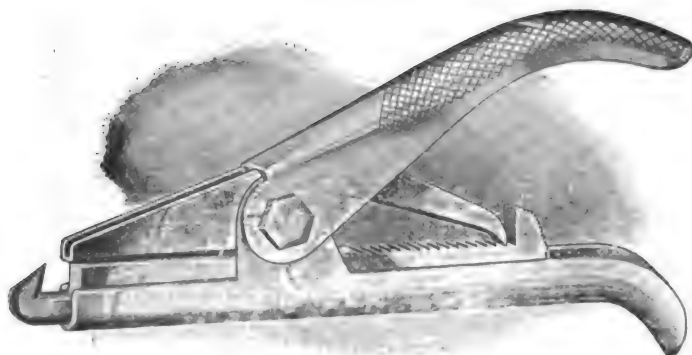
SCHRADER INFLATING VALVE.

Those garage men who have been annoyed by the carelessness of patrons neglecting to shut off the flow of air after inflating their tires, should investigate the Schrader automatic inflating valve, a view of which is shown on this page. This instrument is for the use of garage owners who provide a free air station for the convenience of their customers, and it is intended to do away with the wastage of air due to the carelessness of patrons who forget to turn off the air influx after using. The Schrader inflating valve automatically locks the bottled air into the tank the

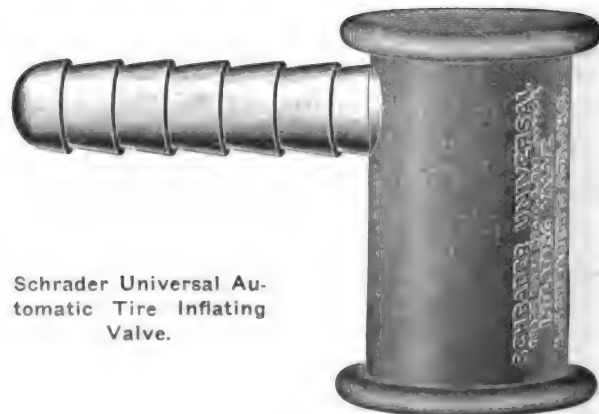


Cassco Tire Pump.

Maxwell, Overland, Reo, Saxon and Studebaker fours and sixes. Any owner can easily attach it himself with the aid of a screw driver and a monkey wrench. The features are the aluminum alloy pistons and the use of guide rods on which the piston slides so as to absolutely prevent any side play on the part of the piston and keep it in perfect alignment with the side walls of the cylinder. The cylinder and the crank case are of treated cast iron and the crankshaft and connect-



May's Cotter Pin Puller.



Schrader Universal Automatic Tire Inflating Valve.

instant it is removed from a tire valve. You turn on the air by pressing the nozzle of the inflating valve against the tire valve, and you turn it off by removing the device. It is made to fit any stock size of hose, from $\frac{1}{4}$ to $\frac{3}{8}$ inch.

Manufactured by A. Schrader's Son, Inc., 800 Atlantic avenue, Brooklyn, N. Y. Price, \$1.

STANLEY GARAGE DOOR HOLDER.

The Stanley No. 1774 garage door holder consists of an arm of steel that holds the garage doors open almost at right angles, even against the most violent gusts of wind. A slight pull on the chain and the door is free to close. They are adapted for doors of any shape and for left or right hand doors. The length of the holding U arm is 30 inches. This device can be fitted even to curved top doors, and is valuable equipment.

Manufactured by the Stanley Works, New Britain, Conn. Write for prices.

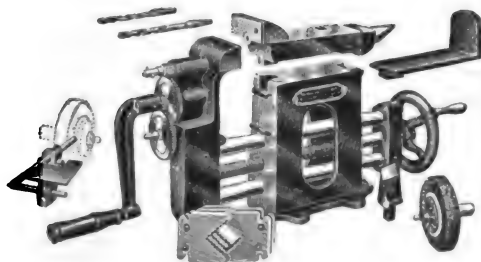
NEW WALDEN-WORCESTER SETS.

Recognizing the increasing demand for special wrenches that will enable all workers on motor vehicles to do their jobs quickly, properly and economically, the maker of Walden-Worcester wrenches has introduced special sets for the Overland, Buick and Dodge Bros. cars as a supplement to the W-W Ford sets. They are shown in our illustrations and are designed to fit every nut, bolt and clamp and can screw in any section of the chassis. All parts of Walden-Worcester wrenches are made of steel, the sockets are machine turned and broached $\frac{1}{64}$ inch over size, making a perfect fit.

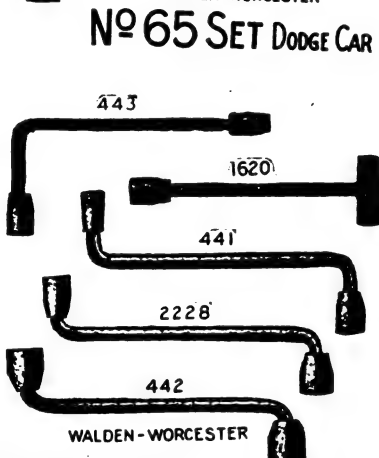
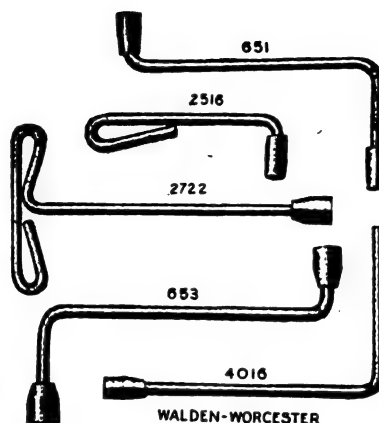
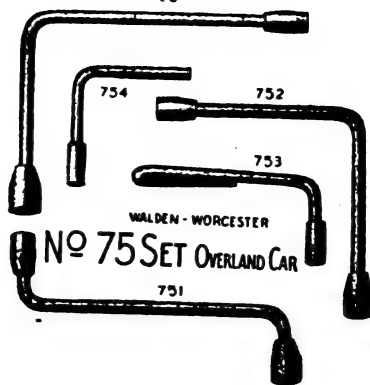
Manufactured by the Walden Manufacturing Company, 60 Commercial street, Worcester, Mass. Write for prices, which are surprisingly low.

STEWART HANDY WORKER.

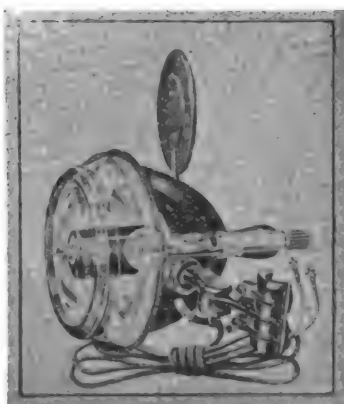
The Stewart Handy Worker consists of the principal machine shop tools built into one compact outfit, which comprises a two-speed drill press, grinding outfit, powerful vise and pipe vise, heavy anvil metal cutter and a sturdy three-speed machine with clamp spindle for attaching and operating emery wheels, scratch brushes, buffing wheels, etc. Included with it are a 5" by 1" carborundum grinding wheel with a rest for holding the



Stewart Handy Worker.



Three New Walden-Worcester Special Wrench Sets for Garage and Repair Work.



Old Sol Nitrojector No. 100.

tool or material being ground; two square shank drills and a drilling rest; also a hardie to put in the anvil to cut small metals. By means of a train of three gears any one of three speeds may be had by inserting the handle furnished into the shank of the proper gear. This is for drilling or operating the emery wheels. The various parts are so arranged that they may be disassembled.

Made by Chicago Flexible Shaft Company, Chicago, Ill. Price, \$12.50 each.

BO-HART SWITCH LOCK.

The Bo-Hart switch lock is applied to the face plate of a switch to control the mechanism in cases where the locking bar is operated by an ordinary tanged-key. It embodies a three tumbler Yale barrel, provided with a small gear transmission to inter-connect the barrel with the regular locking bar of the switch. The tanged-key for operating the locking bar is at all times within its recess and consequently it is impossible to shift the Yale barrel without shifting the locking bar. It is only possible to throw the locking bar by means of a Yale key. The key can be removed only when in locked position.

Manufactured by the Bo-Hart Auto and Machine Company, Lancaster, N. Y. Retail price, \$4.

OLD SOL NITROJECTOR.

The Old Sol Nitrojector No. 100 is a new type windshield spotlight designed to conform to the most stringent anti-glare laws and yet give maximum light. Its main feature is the patented double cylindrical shutter, which confines and directs the rays away from the eyes of anyone looking directly into it. The shutter is operated by a thumb screw and its range is from a narrow aperture, giving a volume of light only four feet wide at a distance of 500 feet to full opening with maximum volume. The volume of light is controlled by moving the shutter forward or backward, which throws the rays on the reflectors of the lamp, which is provided with nitrogen gas filled bulbs of any voltage desired. Another feature is a finely made diminishing mirror. The Nitrojector is made of pressed steel, finished in black enamel and equipped with a patented adjustable universal joint.

Manufactured by the Hawthorne Manufacturing Company, Bridgeport, Conn. Retail price, complete with cable and connections, \$10.

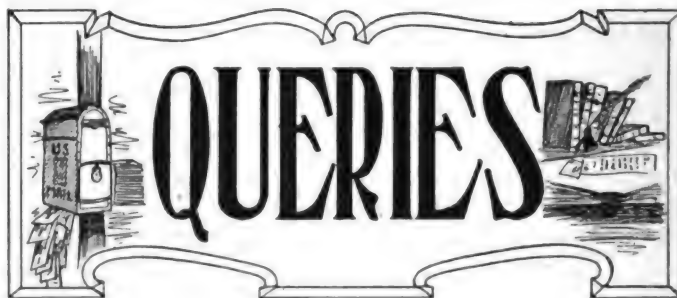


Bo-Hart Switch Lock.



Charles River,
Mass.

(When Writing to Advertisers, Please Mention The Automobile Journal.)



NOTICE TO READERS.

THIS department contains the Mechanical Editor's answers to readers' inquiries. It is open to every subscriber. If any part of your car is not operating satisfactorily, or if you desire information regarding operating, maintaining or repairing motor cars, do not hesitate to lay your troubles before him. He will answer promptly and fully, either by mail or in these columns, as you direct. This service is free to every subscriber, and is often the means of saving considerable money that otherwise would be spent with a garage man. Letters should always be signed with the writer's full name and address, and the car or part in question should be properly identified, by mentioning the maker's name, model, year of production or other distinguishing feature. Address all inquiries to the Mechanical Editor.

PROPER ANTI-FREEZE MIXTURES.

(R. E. G., Kokomo, Ind.)

What am I to believe in the matter of properly preparing anti-freeze mixtures for my car? One garage man tells me to use certain kinds of ingredients, while another tells me that they are positively injurious to the cooling system. I refer particularly to solutions in which calcium chloride is one of the chief constituents. Can you give me some authoritative advice?

While your inquiry is somewhat too vague for a positive answer, you not giving the full particulars of the mixtures you refer to, the following advice from one of the leading authorities in the country will be found valuable. The authority is Max Hagelstine, service manager of the Studebaker Corporation, whom you will agree is, because of his profession, in a position to give advice. He writes as follows:

"While it is true that some motorists make adequate preparations for cold weather, it is also true that a great many wake up mornings and find that Jack Frost has got in his work; that the radiator is damaged and the cylinders cracked. And to my way of thinking, cracked cylinders and split radiator tubes cost a lot more than alcohol or glycerine.

"It is not always the man who has his first machine that is caught napping. Experienced motorists are not infallible, and it is that class of owners who never cross a bridge until they come to it that bring business to concerns which repair radiators and to those makers who supply spare parts.

While the most easily prepared solution is, perhaps, the calcium chloride, it is absolutely the wrong anti-freeze mixture to use. A number of cars have recently been brought into the Studebaker service station for repairs which, upon investigation, showed that calcium chloride apparently had been used in the radiator. Unless one can secure the chemically pure form, calcium chloride is a mighty dangerous solution to use.

The commercial calcium chloride, commonly sold for an anti-freeze mixture, is highly injurious because of its action on the components of the cooling system. Such alkaline solutions are productive of an electrical action wherever two dissimilar metals are utilized, such as the brass tubing of a radiator and the solder used at the joints; the iron water jackets and the brass or copper plates, etc. And, too, I strongly advise against the use of all soluble salts, because of their harmful action on the metal.

"In addition to damaging the radiator, the use of calcium chloride may work havoc with the cylinders, the pump and the inlet and outlet water pipes. The owner usually has to buy a new radiator before he can put his car in service again,

besides having to stand the cost for the labor of replacing with new. And the expense does not always end with this work.

"A summary of the opinions of motor car manufacturers as to the value of various anti-freeze solutions shows a decided preference for denatured alcohol and glycerine. The proportions for the use of the alcohol depend upon the temperature. It will require a five per cent. solution of alcohol to prevent freezing at 25 degrees, and a 23 per cent. solution will take care of the water system down to zero. As low as 10 below the solution should be 30 per cent., and if the mercury drops to 15 below the percentage will be 35, whereas 10 more degrees below will require a 40 per cent. solution.

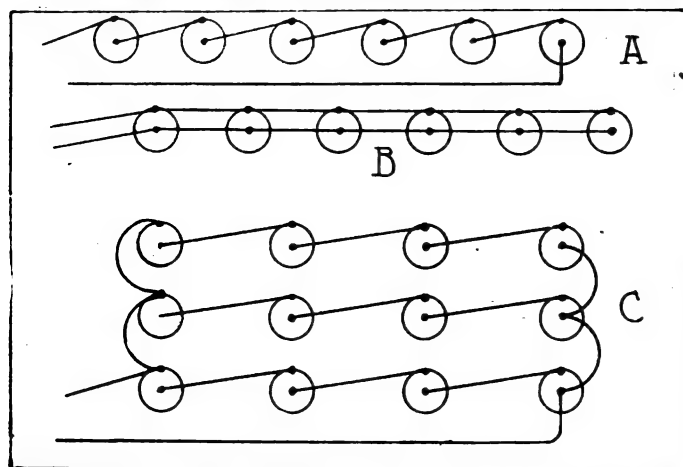
"Alcohol has one undesirable feature, however, and that is its evaporating proclivities. But if you will take the trouble to add a small amount of glycerine to the alcohol as you prepare it for the radiator, you will greatly reduce the evaporating rate. Regarding glycerine, the unbleached variety which may be procured at practically any drug store, is cheapest and best."

METHODS OF CONNECTING UP DRY CELLS.

(W. W. L., Warren, R. I.)

What are the different ways of connecting up dry cells, and will you tell me what the purpose is in wiring them together? Of course I have some idea what the reason is, but I would like to have you explain the methods and the purposes, and also the effects.

The accompanying sketch illustrates three ways of con-



Connecting Up Dry Cells—A, the Series Arrangement; B, Connecting in Parallel; C, Multiple Series or Series Parallel Grouping.

necting up dry cells, that at A being known as the series arrangement, at B the parallel and at C the multiple series or series parallel.

The ordinary dry cell develops about 1.5 volts and has a capacity ranging from 15 to 23 amperes. You probably know that voltage represents the strength of the current and amperage the rate of flow.

The average transformer coil used for ignition purposes on motor cars utilizes a current of between six and eight volts, which is obtained with dry cells by connecting them in series as shown at A. The current flows through the cells in succession, each increasing the voltage of the next cell by an amount approximately equal to its own voltage. Connecting cells in this manner does not increase the amperage; it decreases it as the resistance is increased by the series connection.

To increase the rate of flow, or amperage, the dry cells are connected in parallel, as at B. All zinc terminals are connected in one series and all carbon terminals in another. With this arrangement the voltage of each cell, regardless of the number in the group, remains the same as though single. The amperage, however, is stepped up by an amount equal to the product of the amperage of one cell multiplied by the number of cells in the group.

Groups of cells wired in series may be connected in parallel, as at C. This combination is described as series par-

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It is stamped in black on orange colored cans *only*. Best dealers sell and recommend NON-FLUID OIL.

"K-00 Special" grade is for gears.

"K-000" grade is for bearings.

Write for free booklet "Lubrication of the Motor Car."

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THE NEW DEPARTURE MANUFACTURING CO. CORNERS PATENT BUILDING BRISTOL, CONN., U.S.A.



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Five-Passenger Touring Car \$ 825
Three-Passenger Roadster 825
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GRANT MOTOR CAR CORPORATION, Cleveland, Ohio.

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DIXON'S
GRAPHITE
Automobile
LUBRICANTS

turn friction into fiction.

The right Dixon lubricant for each part means increased power, mileage, safety. Ask for booklet No. 210 G.

JOSEPH DIXON CRUCIBLE CO.,

Established 1827

JERSEY CITY, N. J.



FLows FREELY AT ZERO

Starts with the Engine

This is most important during the winter months. You should know whether the oil you are using "flows freely at zero." All oils do not possess this feature—notably the paraffine base oils, which thicken up under cold, and often cause great damage to the motor.

The safe way is to ask for **SUPREME AUTO OIL**—it "flows freely at zero," and leaves no carbon, owing to the fact that it is a Southern Asphalt-base oil, containing no paraffine to gum, stick or thicken.

There is More Power in
That Good Gulf Gasoline and
Supreme Auto Oil

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BRISCOE

"A line of three leaders."

Briscoe Twenty-four, \$625, electric starting and lighting; full equipment.
Briscoe De Luxe Eight 38 \$985; Four 38 \$785.

Write or wire.

BRISCOE MOTOR CORPORATION, 157 Leroy Ave., Jackson, Mich.

Allen \$850
r. o. b. factory
MOTOR CARS
THE ALLEN MOTOR CO., FOSTORIA, O.

allel or series multiple, and may be considered as a single cell of large voltage. In the group shown, the voltage would be approximately equal to that of four cells connected in series and the amperage would be equal to three times that supplied by one group in series. When the cells are so arranged and connected to an outside circuit, the demand on each cell is one-half that on a cell in a single series group.

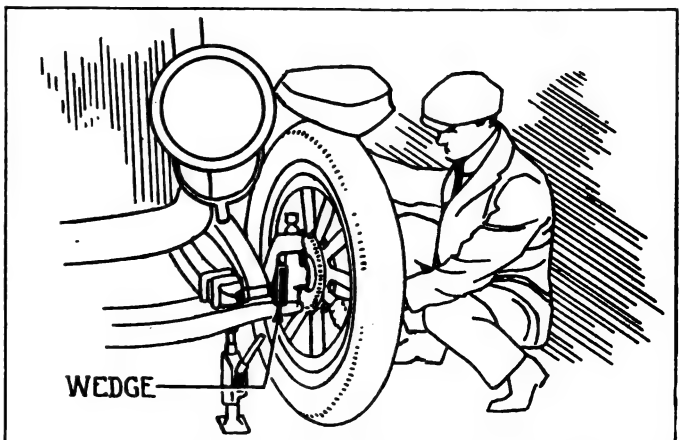
The advantage of connecting cells in multiple series is that the demand on the individual cell is reduced, thus increasing its life and at the same time obtaining the desired increased voltage. The greatest efficiency is obtained from dry cells when the rate of discharge in amperes is the lowest.

FRONT WHEELS STILL WOBBLE.

(P. G. D., Troy, N. Y.)

How can I test the bearings of the front wheels of my car? They wobble considerably, though I adjusted the bearings according to the directions in the instruction book I got when I bought the car. They worked all right for a time, and then began to wobble just as bad as ever. Can it be that the bearings are defective? When I adjusted the bearings the first time I found on taking off the wheel that one of them was damaged. I remember that you printed something on this subject some time ago, and wonder if you will do the same for me?

Though it is almost impossible to determine if the bearing was defective or not without examining it, it is apparent that it had been damaged by being improperly adjusted.



How to Wedge and Test Front Wheels for Play in Bearings.

When a bearing is adjusted too tightly the lubricant is prevented from circulating in the proper manner and consequently the friction of the working parts is not offset as is intended, and scoring and breakage is the result.

If you want to try out the wheels for play in the bearings follow the method shown in the accompanying illustration. Jack up the wheel to be tested and drive in a wedge of wood, or similar material, between the spindle and axle to prevent any movement of the steering knuckle on the king pin. Grasping the wheel at top and bottom try to rock it.

Should you find that the bearings are loose you can take up the lost motion by removing the hub cap and screwing up the adjusting nut until the bearing is a snug fit, after which turn back the nut about a half turn and lock securely. Turn the wheel slowly to determine that it revolves freely and does not bind. If this procedure does not bring about the desired effect write to the manufacturer of your car and explain your trouble fully.

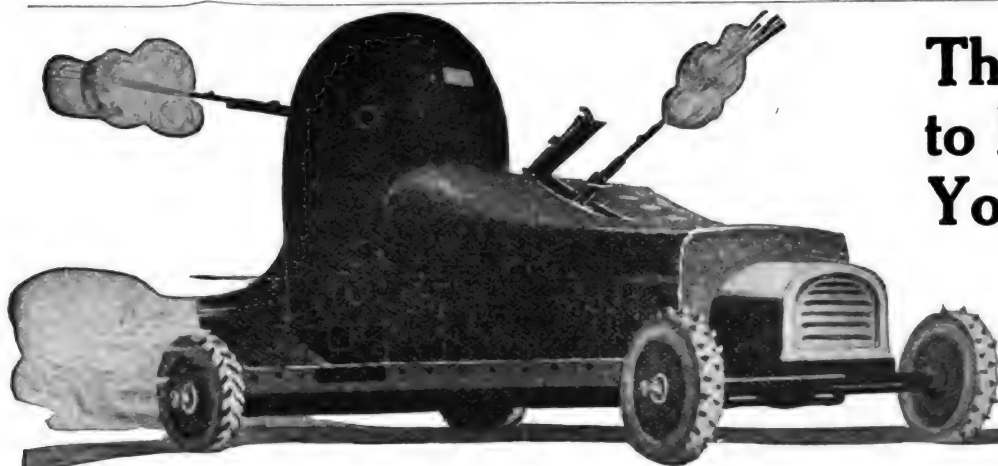
HOW TO CLEAN CELLULOID.

(A. F. W., Garfield, N. J.)

The celluloid windows on my storm curtains have become dirty and discolored. Water does not seem to "touch" it. Can you advise me how I can clean them without harming the celluloid?

First make certain that the windows are made of celluloid. If the celluloid has become discolored throughout, its

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The Best Way to Protect Your Motor!

To protect it from ignition troubles of any kind install an

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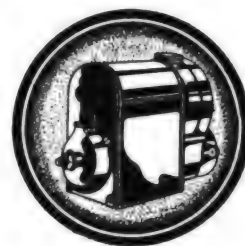
MAGNETO

You'll be sure of full power from every explosion; the intensely hot spark—even at very low speed—takes care of that! You'll have ignition you can depend upon—easy starting—sure fire of any mixture, richest to leanest—that's the Elsemann Reputation.

THE EISEMANN MAGNETO COMPANY

Sales and General Offices, 32-33d St., Brooklyn, N. Y.

Detroit, Mich., 802 Woodward Ave.



whiteness cannot be restored; but if it is superficially discolored its condition can be considerably bettered by wiping with a woolen rag moistened with absolute alcohol and ether, mixed in equal proportions. This mixture will dissolve and remove a minute layer of the celluloid and leave a new and clean surface. To restore the polish, rub briskly, first with a clean woolen cloth, finishing with silk or fine chamols. A little jeweller's rouge or Putz pomade will greatly facilitate the work of renovation.

BACKFIRING IN COLD WEATHER.

(H. O. J., St. Albans, Vt.)

Why should my engine backfire on cold mornings when I start it up? After I have been running it a few minutes the trouble disappears. I have asked several fellows, but they cannot tell so that I understand.

Cold weather causes the backfiring. At low temperatures the fuel does not vaporize as readily as it does in warm weather, or when the atmosphere in the engine has become heated, and this results in too small a proportion of gasoline to the amount of air admitted, or what is generally known as a lean mixture. One way of overcoming the trouble is to adjust the needle valve of the carburetor to supply more fuel, or decrease the amount of air supply. Such an adjustment will, of course, provide a rich mixture when the engine has warmed up. If the adjustment of the carburetor is satisfactory it would be better to restrict the air openings until the motor becomes warm.

NO HELP FROM A PRIMER.

(P. G. K., Eldorado, Kan.)

Though I put a primer on my Ford I am not able to start it any easier than before I used the primer. In fact, it seems to me that it is even harder now. The primer is a small can on the dash with a hollow tube connecting with a tap on the manifold. If I should put in batteries would I get better results?

(When Writing to Advertisers, Please Mention The Automobile Journal.)

Answering your last question first, there is no doubt that you would get good service by installing batteries. When installing ground one end of the battery and connect the other with the blank side of the switch, or the side opposite the present magneto side. You can use either five to eight dry cells for the purpose or a six volt storage battery.

Regarding the primer, it is possible that you allow too much gasoline to run into the manifold. About a thimbleful of gasoline is sufficient under ordinary circumstances for each cylinder. Over-priming is certain to result in difficult starting. It may be also that your sparks are not hot enough. If so see that your connections are tight and that the magneto magnets have not become too weak for the work they are assigned to perform.

TUNGSTEN STEEL AND MAGNETS.

(H. P. T., Wareham, Mass.)

What is tungsten steel that the magneto makers use? Is it better for their work than regular steel, such as chrome nickel, and is it a combination of alloys or a metal by itself? Manufacturers seem to lay much stress upon the fact that they use tungsten steel in some parts of their machines, implying that it is far superior to any other metal for the purpose.

Tungsten as a metal is a comparatively rare element of the chromium group and is found combined in certain minerals, such as wolframite and scheelite. It is isolated as a hard, brittle, white or gray metal, melting at approximately 2000 degrees centigrade and having a specific gravity of 16.5-19. It is also called wolfram.

As a metal, steel containing a small amount of tungsten is noted for its tenacity and hardness, even under considerable degrees of heat. It is used largely for magnets, since it retains its magnetism longer than ordinary steels. By simultaneously incorporating carbon and tungsten in iron, it is possible to obtain a much harder steel than with carbon alone, and without danger of extraordinary brittleness in the cold.

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MAGNETO
Original in Design,
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Ask For The Best Wrench

Your dealer will show you just the size you need for your tool kit, or for repair work.

He will recommend the COES wrenches as all good dealers have done for fifty years.

Coes Wrenches do not break, or wear out, in service life they cost less than any other tool made.

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**THE ORIGINAL
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You can get it anywhere.

metal or increased difficulty in the working of the metal when it is heated.

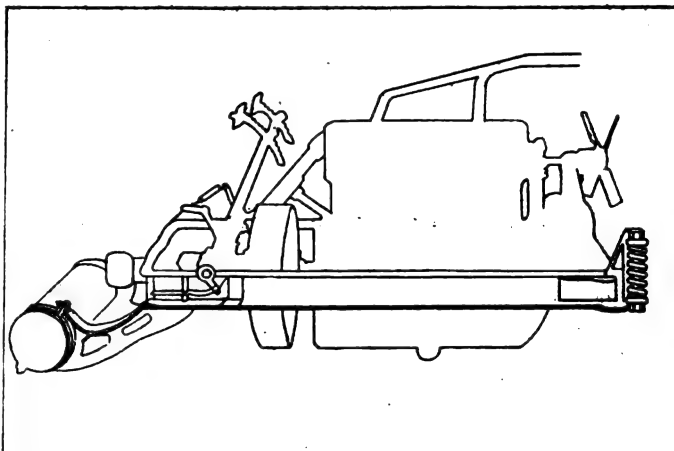
FLOATING TRUCK POWER PLANT.

(Y. S. B., Raleigh, S. C.)

I do an extensive trucking business by motor trucks and naturally interested in every development that appears in relation to them. I heard recently of the floating power plant of the United States motor trucks. What is it? Can you describe it?

This power plant is described in more detail than we can afford in this department at this time by the United States Motor Truck Company, Cincinnati, O., in its recent catalogue of its products, which the company advises will be sent free of charge to any inquirer.

The floating power plant as used in the United States truck is one of the features of that make, and is roughly illustrated in our sketch. It will be seen that the engine, clutch, muffler and other parts are bolted to a subframe, which is carried as close to the engine block as the flywheel will allow. It will also be noticed that the three-point suspension principle is followed and that the front of the subframe is carried on coil springs, to which are attached the brackets on the truck frame. This arrangement results in the cushioning of the upward and downward motions of the engine. At the other end of the subframe is a five-inch ball, which supports the rear end of the subframe on a cross member of the main frame. This construction permits the main frame



Rough Sketch of the Floating Power Plant of a United States Motor Truck.

to twist in every direction without straining the subframe or the power plant.

LOW GRAVITY GASOLINE.

(S. E. K., Hartford, Conn.)

I recently had a discussion regarding the effects of low gravity gasoline on the average motor. The contention was made that the low gravity fuel if properly carbureted would produce as much power as the high gravity product.

A low gravity gasoline, which contains considerable kerosene, in the first place would not volatilize properly in the ordinary carburetors which are designed for gasoline carburetion of a certain specific gravity. If it was thoroughly carbureted, however, the low gravity gasoline, quart for quart, would give about as much power as the high gravity quality, other things being equal.

In cold weather, the low gravity gasoline has a greater tendency to remain in the liquid form than the high gravity fuel, consequently, unless the engine is running continuously to maintain a high temperature, there is a tendency for the kerosene to condense again after being projected into the combustion chamber and run down past the piston rings into the crank case, where it becomes mixed with and dilutes the lubricating oil. Lubricating troubles result and some times an owner is at a loss to explain the cause. For this reason it is considered a good plan to thoroughly drain the lubricating system in cold weather every 1000 miles of travel. A smoking engine is sometimes indicative of such a condition.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

ADJUSTING SCHEBLER CARBURETOR.

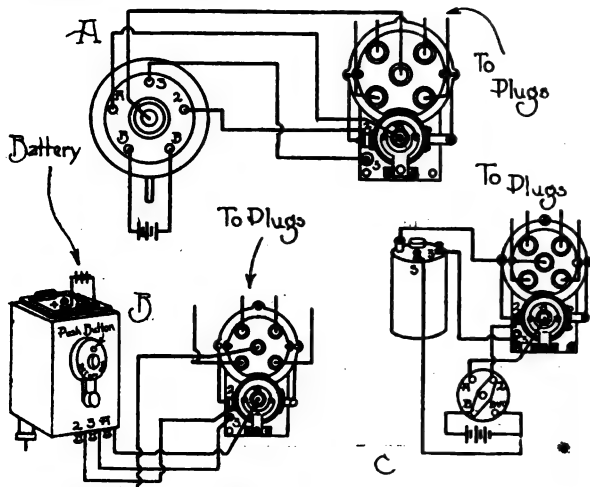
(B. I. G., Tarrytown, N. Y.)

If you can find the time I would like to have you tell me, either through the columns of your next issue, or by mail, how to adjust a model L Schebler carburetor, and also how to wire a model D Splitdorf high-tension dual magneto.

It is better to have an experienced person undertake the work. But if you wish to do it yourself, make sure of these points before attempting to adjust the instrument: Determine if there is a hot spark at each spark plug, that the valves are timed properly and are seated full and that all connections are tight.

The first operation is to set the auxiliary air valve so that the valve seats lightly but firmly. Close the needle valve by turning the adjustment screw to the right until it stops. When you feel resistance do not try to turn the screw further. Next turn the screw back to the left about four turns and then prime the carburetor. Open the throttle slightly and start the engine. Then retard the spark and throttle levers and adjust the throttle lever screw and the needle valve adjustment screw so that the engine operates at the desired speed and fires on all cylinders. This is the low speed adjustment.

After obtaining a satisfactory adjustment with the engine running idle, do not touch the needle valve adjustment again. The intermediate and high speed adjustments are made on the dials. Adjust the pointer on the first dial to about half way between the figures one and three. Advance the spark



Wiring Diagram for Splitdorf Models A, B, D, F, O and T Magnetos—A, Splitdorf Magneto and T. S. Transformer; B, Splitdorf Magneto and Dash Transformer; C, Splitdorf Magneto and Tube Transformer.

and open the throttle so that the roller running on the track below the dials is in line with the first dial. With the spark advanced, if the engine backfires with the throttle in this position, turn the indicator a trifle more toward the figure three. If the mixture is too rich the indicator should be turned in the opposite direction. This is the intermediate speed adjustment.

Now open the throttle wide and make the adjustment on the second dial for high speed, working in the same manner as when making the adjustment for the intermediate speed.

The model D Splitdorf magneto is listed by the maker as a low-tension type. You do not give the type of transformer used, so we publish the accompanying sketch to show the wiring diagrams for both dash and tube transformers.

USE OF ALUMINUM.

(D. O. W., Napoleon, O.)

In many of the new models coming out this year I notice that the makers have made extensive use of aluminum in crank cases and in other parts. How is it that this metal was not more generally used before and what are its advantages?

Aluminum while weighing only one-third as much as cast iron, has the same strength and also reduces the weight of the power plants, bodies and other parts. Consequently

(When Writing to Advertisers, Please Mention The Automobile Journal.)

If You Have Engine Trouble, Read This

WHEN the ignition system of an engine depends upon a battery, the possibility of trouble is evident—so much else depends on that battery too.

Ignition should be alone, independent of all other units; it should be produced by a good magneto which performs no other function than producing reliable and efficient ignition. When you have magneto ignition, then and only then can you be free of puzzling ignition worries and starting difficulties.

Special Bosch Attachments for the installation of the reliable Bosch Magneto to replace ignition systems depending upon batteries or dynamos are now available.

A very interesting book on this subject awaits your request to send it.

Write today

Bosch Magneto Company
204 West 46th St., New York





“For 4 years I have used the same set of SPLITDORF SPARK PLUGS Never any trouble”

*H. A. SEIFKE, San Francisco, Cal
PIERCE ARROW*

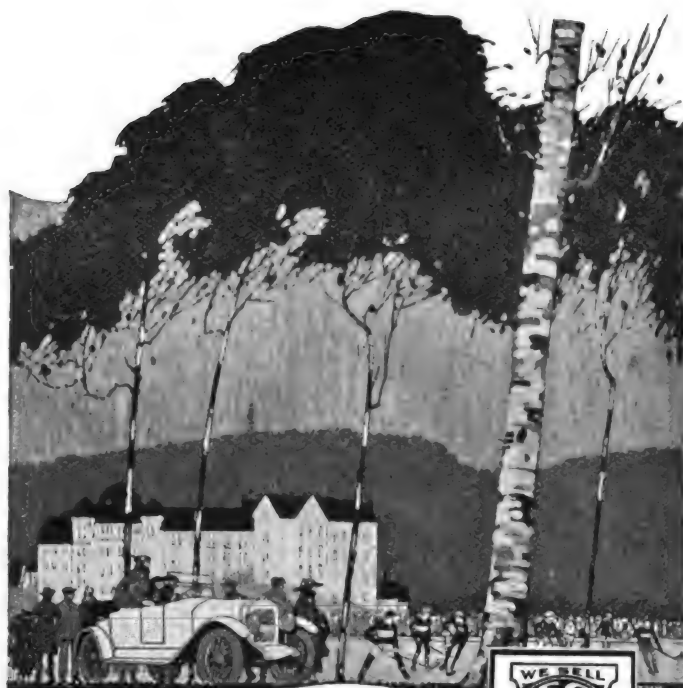
Made in all sizes and in types to suit every car, motorcycle, motor truck, motor boat, aeroplane, tractor and stationary gasoline engine. If you can't get them from your dealer, send to us for them.

SPLITDORF ELECTRICAL CO.
Newark, N. J.



SPLITDORF SPARK PLUGS

The Plug with the Green Jacket



No Day Too Cold for POLARINE

The Standard Oil for All Motors

Polarine feeds freely down to zero, giving to your motor the easy rhythm of mid-summer.

You will get more distance to the gallon with less wear on your motor by using Polarine Oil and SOCONY Gasoline. Look for the Red, White and Blue SOCONY Sign.

STANDARD OIL CO. of NEW YORK

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NEW YORK
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BOSTON

POLARINE

manufacturers have begun to use it wherever it is practical. At the present time it costs many times what iron does per pound and for that reason is not used in large quantities, only in the high priced automobiles. Through its use a better finish is obtained on the part and it is also impervious to the weather and will not rust. Its use in pistons results in a better balanced motor.

DISENGAGING THE CLUTCH.

(A. E. S., Boston, Mass.)

I am told that it is a better plan to have the clutch connected to the emergency brake than to the foot brake. Why this preference?

It is better practise to have the clutch attached to the emergency brake, as when the emergency is relied upon it is always necessary to have the clutch out, while the foot brake is often applied when starting up an incline while the clutch is being thrown in. Otherwise in such a situation it would be necessary to hold the car with the emergency while the clutch was being engaged and this would prove inconvenient.

INQUIRES ABOUT CYCLE CARS.

(S. F. A., Moscow, Penn.)

Please give the addresses of a half dozen manufacturers of narrow tread motor vehicles, auto or cycle cars. Have any been manufactured that carry three passengers?

Dunn Motor Works, Ogdenburg, N. Y.; Woods Mobillette Co., 2007 South Michigan avenue, Chicago, Ill.; Culver Mfg. Co., Culver City, Cal., all build two-passenger cars. Cycle cars have been built that will carry three passengers, but there is apparently no demand for machines of this type.

What may be also regarded in this class is the Duryea Gem, built by the Duryea Motors Co., Philadelphia, Penn., which has three wheels and will carry two passengers. Side cars that will carry one or two, and in some instances three passengers, are built and are attachable to any motorcycle of five or more horsepower rating. Motorcycles are built by the Hendee Mfg. Co., Springfield, Mass.; Pope Mfg. Co., Westfield, Mass.; Harley-Davidson Motor Co., Milwaukee, Wis., and numerous other concerns to which either side cars or fore carriages, by which the tricar type is obtained, may be easily attached.

HAS TROUBLE STARTING FORD CAR.

(M. J. L., Chatham, N. J.)

Will you explain an easy way to start my Ford car? I have difficulty starting mornings.

To start your Ford car easily when it is cold, follow these directions closely: Retard the spark lever; open the throttle lever about half way; leave the switch key in the "Off" or neutral position. Pull out and hold the priming wire, and while holding the priming wire out, turn the engine over several times. This is to give the engine a complete charge of gas in all cylinders. Now turn the switch to the magneto or battery position, according to which you are using, give the engine a quick turn and it will instantly start. Get gas into the cylinders and it is not difficult to start an engine. The gas volatilizes slowly in cold weather and turning the engine will make a very large difference in the starting.

NAHPHTHALINE TO AID STARTING.

(C. H. G., Valley Falls, Kan.)

1.—Would using naphthaline start a Ford car easier than when using gasoline? Would there be danger if about two ounces were used with five gallons of gasoline?

2.—Will the bulb of a Ford headlight burn out quickly if one of them is used separately? It is sometimes necessary to burn only one at a time, for instance, when one burns out on the road. I then ground the other and use it by itself, but it does not last long. The bulbs are nine volt two amperes.

If you have trouble starting cold weather there is no

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THE NATIONAL AUTO SHOWS



Under Auspices of National Automobile Chamber of Commerce, Inc.

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The Usual Courtesies to Visiting Dealers

practical method of improving the quality of the gasoline. No solution is known that will improve the volatilization of the gasoline, and this is the quality that is lacking in low temperatures. Undoubtedly your machine operates satisfactorily when warm. When starting the car, retard the spark lever and open the throttle lever about to the centre of the quadrant. Next draw out the priming rod, or wire, and hold it while you give the engine a few rapid turns. This will flood the carburetor and draw a rich gas into the cylinders. Now turn the switch to fire the engine and turn the starting crank sharply. The engine should fire instantly if the ignition system is practically operative.

You are quite right in believing that if one light bulb only is used, by grounding the other light, it will quickly burn out. I would suggest that you carry an extra pair of lamps in a container you can purchase from any accessory dealer, in which they can be kept in good condition indefinitely.

TESTING VIBRATOR COIL UNITS.

(J. B., Detroit, Mich.)

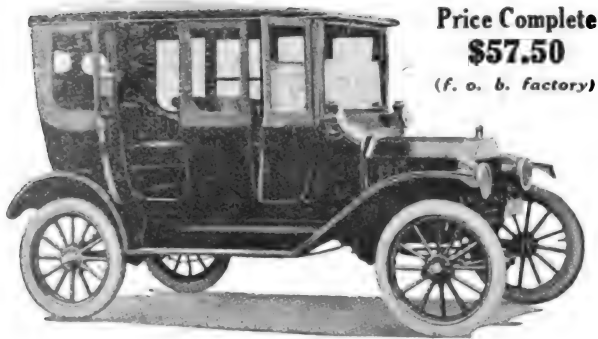
I have a 1913 Ford roadster and one of the four vibrating coil units does not vibrate save when the engine is running at high speed. I tested all the units with two dry cells and found one that would not vibrate. Has the magneto more "juice" than the dry cells, for at high speeds the coil will vibrate? Can you give me the cause of the unit failing at low speed?

You do not state how you made the test with the dry cells, that is, whether the units were tested individually out of the coil box, or in the coil box. I would suggest that you take the four coil units out of the coil box and test each separately with the dry cells. The cells should be coupled with connectors from the positive (centre) terminals to the negative (side) terminals, which will be a series arrangement, and the voltage will be the number of cells multiplied by two. Two cells will give four volts, three six volts, and so

on. To the centre terminal of one end cell and the side terminal of the other end cell, connect two wires. Strip the ends of the wires of the insulation for a couple of inches and twist the ends into loops. When testing the coil units place them on a bench, box or floor on their sides. On the front or dash side of each will be found two brass discs or contact points, and on the bottoms one contact disc. Place the units with the lower of the two front contacts within 1/32 inch of a piece of steel or iron—a hammer head, wrench or any tool will serve. Touch one loop of the wires connected with the battery to the upper contact disc at the front of the battery and the other to the contact disc at the bottom of the battery and a spark will be formed between the lower front contact and the tool or piece of metal. The spark should be "fat" and white or blue. If you cannot get a good spark the insulation of the coil may be ruptured or the condenser may be damaged. See that you have no loose connections on top of the coils and no loose or badly worn platinum points.

If, after this test, you find a coil unit that will not spark, return it to the maker or to a Ford dealer and have it replaced with a new unit. If all the units show good sparks after the test stated and you are unable to get a spark at the plugs, see that the spring contacts inside the coil box have good tension. Examine the binding nuts on the front side of the dash, to see if any of the nuts that secure the wires from the timer are loose. There may be poor connection there. Examine the binding nuts on the timer, and finally examine the timer for a loose or worn contact roll, a loose contact spring or a badly worn fibre contact block. There is a bare possibility you have a broken wire inside the insulation of the timer. You might test the timer wire with the battery to see that there is no defective or broken wire connecting the particular coil unit to the timer. You should go over the wires from the timer to the dash binding posts to know that they are intact and that there is no ground of the current from them. This instruction takes in fully the entire ignition system, save the magneto, and if followed will locate the cause of the failure of the coil.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

FOR 1914-15-16 and 17 FORDS

Price Complete
\$57.50
(f. o. b. factory)

The Springfield Top Notch Top makes the Ford touring car an all-weather machine—cold, rain, dust and dirt proof.

The windows are of plate glass and the doors open like those of a mouline. This top fits snugly and it will not rattle or squeak. The finish is the same as the fitting of the car. It makes an attractive, substantial body, giving all the comfort of the enclosed car.

TOPS FOR MAXWELL CARS

These tops are superior to other makes in design, construction, workmanship, material and finish.

(Price Complete \$150. f. o. b. factory)

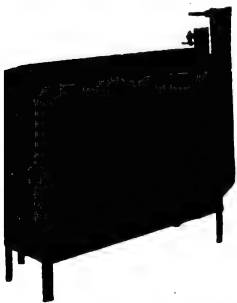
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**"SUPERIOR" or a "COSY"
Safe Garage Heater**

All air taken from outside building.
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VALUE AND QUALITY**

Fairfield "Six-46"	- - -	\$1375
Seven passenger	- - -	
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PAIGE DETROIT MOTOR CAR CO., Detroit, Mich.

VALVOLINE OIL CO.

Heavy, Medium and Light

Automobile Oils

27 STATE STREET BOSTON, MASS.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

GRAPHITE AS LUBRICANT IN FORD.

(E. A. S., Stoughton, Mass.)

Would you kindly let me know if graphite can be used to advantage in the Ford lubricating system, and if so what is the best manner of introducing it into the engine?

The Joseph Dixon Crucible Co., Jersey City, N. J., manufactures Dixon's motor graphite, which is a selected grade of flake formation, especially adapted for automobile engine lubrication, and it can be used to advantage in any car. It will reduce frictional losses in the cylinders, improve compression and by reducing the quantity of oil required will, to a large extent, prevent carbonization and smoking.

Graphite should be used regularly and sparingly, but never should be mixed with the engine or transmission oil in a Ford. It should be introduced directly into the cylinders either through the spark plug holes, through the air intake pipe of the carburetor, while the engine is running, or by means of special lubricators that are attached to the intake manifold. The latter is considered the best method and the Dixon company will give the addresses of lubricator manufacturers and send a chart indicating the proper Dixon lubricant for each part of the Ford car to anyone inquiring for same.

ADVANTAGES OF FRICTION DRIVE.

(J. A. M., Peacedale, R. I.)

What are the advantages claimed for the friction drive transmission or gearless transmission as used on the Metz cars? I understand they claim a number of points of superiority over the gear transmission. Why are they not used more generally?

The gearless transmission, or friction drive by means of a driving and driven disc, is used by several makers of light cars and it has proven efficient as a means of power transmission. It embodies principles of simplicity, lightness and economy in cost of manufacture that has made its use desirable in light cars. It also affords a means of speed reduction and torque increase which is infinitely variable, and can be made to adjust the engine speed to the load being carried in the form of tractive resistance. This feature is very desirable, as by properly proportioning the load to the power of the engine the latter always turns at its most efficient speed. Constant torque is also maintained, as when a change of driving ratio is required it is brought about smoothly and quietly, without interrupting the power transmission to the wheels. Incidentally, it is accomplished with a single movement, instead of a number of operations required to change speeds by the gear shifting method. The abnormal strains resulting from throwing a clutch in and out are also eliminated.

USE OF OLD CARS.

(E. H. G., North Tonawanda, N. Y.)

Is it true that old cars, regardless of make, should never be driven at high rates of speeds over rough roads? A dealer tells me that the danger of ruptured parts from shock increases with the age of a car, whether it is of the high or low priced type.

While present day automobile manufacturers are using a far superior grade of steel in the various parts that go into the construction of a motor car, they have not yet entirely eliminated the tendency of steel to crystallize when subjected to jolts, vibrations and strains. For that reason the longer a car has been run the greater becomes the probability that the parts subjected to the most vibration and shocks will become crystallized to a point where they will break under much less strain than would have been required to rupture them when they were new. It is therefore not safe practice to drive old cars at all the speeds the car is capable of unless the parts that carry the loads and strains have been replaced with new material.

**WINTON
SIX**

Making Your Wishes Come True

Insured happiness awaits Winton Six buyers. The keynote of our plans for 1917 is to satisfy your desires and to make your wishes come true

EVERY Winton Six will be harmonized to its buyer's expectations and ideals. The beautiful individualized car you have pictured to yourself is the car we shall build for you—a car performing its duties with celerity and ease, always ready to go and always equal to your needs; a car that redeems every promise of happy ownership.

The Winton Six 48, now in its tenth year, and the 33, now in its third year, are superb. Their superiority is due to no pretended wizardry and to no special genius on our part. Little by little, thru ten years of making sixes exclusively, we have solved the problems of building highly perfected motor car mechanisms. So, also, by long and earnest practice in meeting the tastes of the most desirable class of buyers, we have evolved the art of creating for each buyer personally just the car he most desires—an art that is beyond imitation. Consider us at your service. Simply telephone or drop us a line today.

Closed Cars
\$3000 and up.
Open Cars
\$2685 to \$3500.

The Winton Company

131 Berea Road, Cleveland

Winton Branch Houses in New York, Newark, Boston, Philadelphia, Baltimore, Pittsburg, Cleveland, Cincinnati, Detroit, Chicago, Milwaukee, Minneapolis, Kansas City, Los Angeles, San Francisco, Seattle.

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AUTOMOBILE JOURNAL PUB. CO.,

Published the 10th and 25th of each month by the
Times Bldg., Pawtucket, R. I.

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EAGLEINE OILS

are unequalled for motor lubrication, freer from carbon, economical because they protect the motor against mechanical wear, and the quantity required is comparatively small.

These are the claims of thousands of motorists,—some with years of experience,—who want full value, and more who know the value of high grade lubricants, and who know when they obtain satisfaction.

**EAGLEINE QUALITY
IS INSURED TO YOU**

A grade for every type of motor.

It is sold in sealed containers

*Let us send you our new book
and chart. It is free at request.*

**EAGLE OIL
AND SUPPLY CO.**

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the big national displays of
motor cars.

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Advance Number Review
January 28 February 10

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(Held March 3-10.)

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February 28 March 10

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Also Service Stations for all
these cars. All kinds of Repair-
ing, such as Motor Work, Over-
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Etc., at moderate prices.

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Elgin Six

"The Car of the Hour" Breaks Another Record

The Elgin Six has just established a new record of 67 ½ hours between Chicago and Miami, Florida.

Thirteen hours of this time was driven in a heavy rainstorm that made the roads slippery and dangerous, and in some places so deep and heavy with mud that the average car could not negotiate them at all.

The route included the steep, rocky mountain grades of Kentucky and Tennessee, the heavy sands of Georgia and the slimy, treacherous, swamp roads of Florida.

The Elgin Six has made perfect scores and won highest economy honors in some of the most gruelling endurance and economy runs of the past year.

Many other remarkable Elgin performances have firmly established the Elgin Six as *A Mechanical Masterpiece*, and a champion for long sustained speed, endurance and economy.

Special Elgin Features

The Elgin Six is the only car in its price class having the fashionable center cowl of the high priced European models. Its beautiful yacht line design was established by a famous artist and gives the Elgin Six a style and distinction that sets it apart from the monotonous design of the average car.

Elgin Engineers have perfected an improved rear spring suspension, found only in the New Elgin Six, which sets a new standard of motoring ease and comfort at high speeds, reducing shock and vibration to a point not surpassed in any car at any price.

The special construction of the Elgin velvet-acting clutch enables the Elgin Six to be started on high gear, under ordinary conditions, eliminating to a large degree the necessity of gear shifting, *thus removing the last barrier to the safe and easy handling of a motor car by women.*

5-Passenger Touring \$985
4-Passenger Roadster \$985

The completion of our big, modern, daylight Plant No. 2 has so increased our production that we are now entering new territory. Yours may be open.

Better wire us today for application blank and full particulars of 1917's best money-making proposition for dealers.

Elgin Motor Car Corporation, Chicago, U. S. A.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

OLD SOL

NITROJECTOR NO 100

THE 100% PERFECT SPOTLIGHT

The Light That does Everything

Think of anything a light should do and
OLD SOL NITROJECTOR will do it.

It will throw a brilliant spot of light or cover the
roadway with a diffused light. It focuses light to any
height desired and to the accuracy of an inch. It controls
the light in any and every direction. It
meets all State laws. It is the most necessary—
the most convenient light ever designed.

The OLD SOL NITROJECTOR is a composite
of every light in one. It possesses at least ten exclusive
and remarkable superiorities.

The genius of Mr. E. A. Hawthorne spent years in perfecting them.

The trade-mark "OLD SOL" has always led in quality—in lighting ad-
vantages, but the new OLD SOL NITROJECTOR has set a standard for
lighting device perfection.

Motorists will welcome its arrival. They will tell their friends about it. Sales will spread
in volume and territory because it brings to every car owner, not only that sense of safety
and "within the law" night driving, but also pleasure and convenience.

Canadian prices: Model 100—\$15.00; No. 70—\$10.50; and No. 77—\$7.50.

HAWTHORNE MANUFACTURING CO., INC.

BRIDGEPORT, CONNECTICUT, U. S. A.

Makers of Old Sol Windshield Spotlights and Electric Lighting Devices



PRICE \$7.00

No. 70—Always a big seller. Many
special features over all other Spot-
lights.



PRICE \$5.00

No. 77—Just right for the smaller
car with the exclusive features in No.
70.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

It complies with every law for a "no-glare" lighting device

Here are some of its exclusive features:—
 The cylindrical double shutter—three silvered reflector surfaces that extract the glare — an original focusing device — a universal bracket—the Old Sol crystal glass lens — nitrogen searchlight bulb — a switch plug integral with focusing device and operating handle — a pilot bulb — instant "on" and "off" control and a handsome torpedo body — five feet of finely braided duplex cable and copper terminals.



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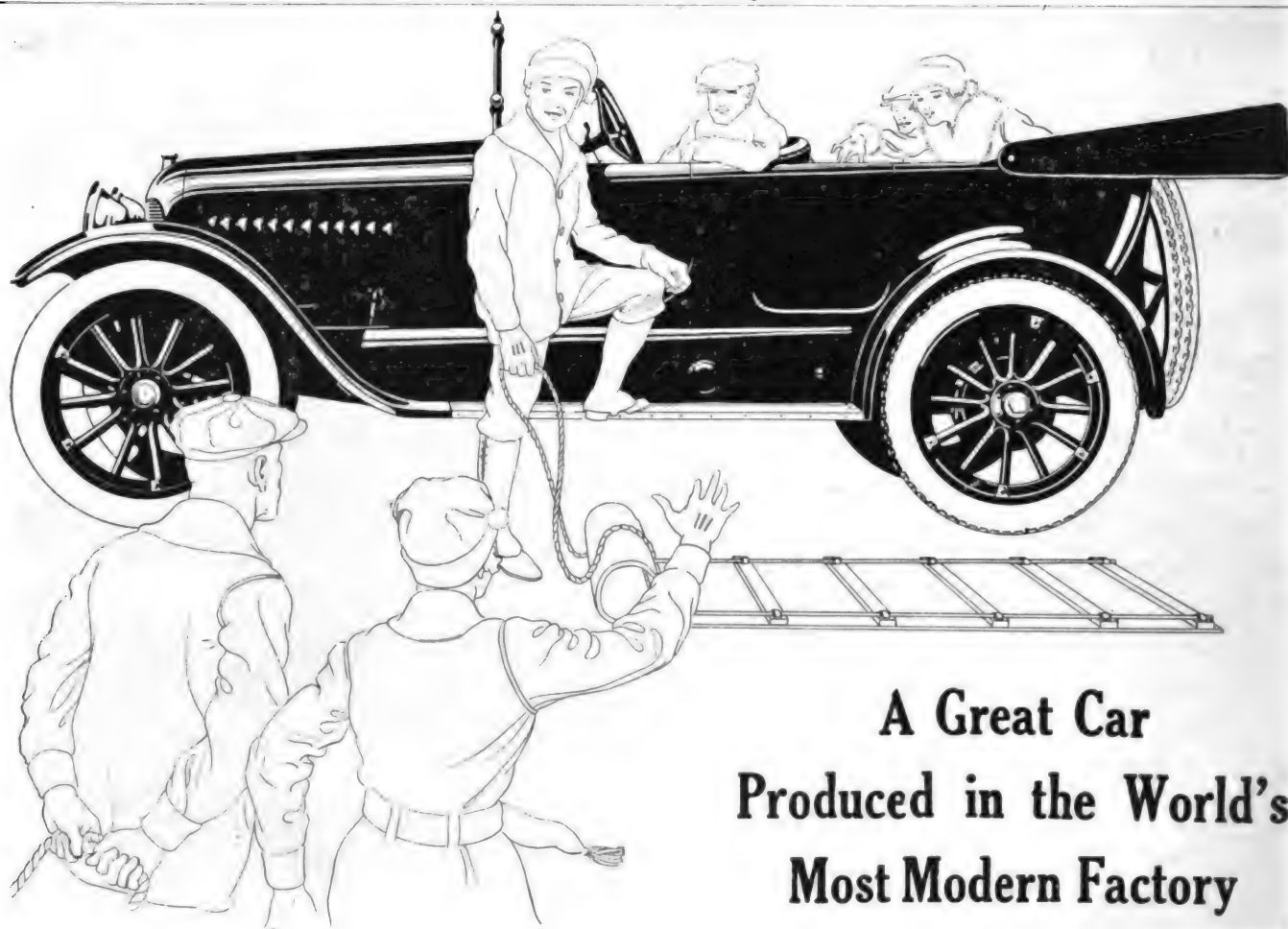
**OLD SOL
NITROJECTOR
MODEL 100**

DEALERS—Here is a surprising profit making business for you. OLD SOL NITROJECTOR will be backed by a smashing national publicity campaign. Get in touch with your jobber at once and arrange for your first shipment. Every car owner in your community will buy one once he knows about it.

JOBBER—If you are not already in a position to take care of your trade "get there" immediately. Write or wire us at once.



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A Great Car Produced in the World's Most Modern Factory

GRANT SIX

Five Passenger Touring Car	- \$ 825
Three Passenger Roadster	- - 825
Five Passenger Sedan, Convertible Top	- - - 1,000
Three Passenger Roadster, Convertible Top	- - - 960

All prices f. o. b. Cleveland

The appeal of the GRANT SIX lies wholly in the magnetic attractiveness of great *value*. Our entire selling argument may be reduced to one word—*compare*.

Compare size, power, beauty, quality, mechanical construction—and price—and you *must* concede Grant Leadership.

Our new factory, at Cleveland—the most modern in the industry—is a marvel of completeness. Equipped with a model system of progressive assembly, it has an annual production capacity of 35,000 cars.

Grant success has been achieved by putting *value* first.

See the latest GRANT SIX at the New York Show and you will understand why we were forced to erect this giant plant.

GRANT MOTOR CAR CORPORATION

Cleveland, Ohio

(When Writing to Advertisers, Please Mention The Automobile Journal.)

"No hill too steep—no sand too deep"

Jackson

The Wolverine Eight Four-Passenger Cruiser

will be one of the features of our exhibit at the shows.

We invite your particular attention to this smart, exclusive craft and to the other Jackson models listed below.

The new Wolverine Eight, with Ferro-Jackson motor, 3x3 1/2 inch bore and stroke, enclosed overhead valves, and other distinctive features, is not only a great Jackson but one of the *greatest cars* of the year.

For flexibility, speed, power, freedom from vibration and economy (17.7 miles to the gallon of gasoline), it outstrips any other eight. To say it is a remarkable car is to speak modestly of its rare qualities. Come and see for yourself.

Four Models

Five-Passenger Touring Car, \$1295; Four-Passenger Cruiser, including five wire wheels, \$1395, wood wheels \$100 less; Two-Passenger Roadster \$1295; Five-Passenger Sedan (Demountable Top) including touring top, \$1505. All prices f. o. b. factory.

See the Wolverine Eight at Chicago and Boston Shows

Dealers if you cannot come to the show write at once for new Catalogue and latest literature

Jackson Automobile Company

1221 East Main Street, Jackson, Mich.



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RAYNTITE The Ideal One-Man Top Material

THE modern one-man top demands light weight. Rayntite single texture top material weighs about half as much as double texture material of equal waterproofness.

It is guaranteed one year against leakage, but built to last the life of the car.

Its strength is ample to stand the strains of service.

Why make your car top heavy, and the "one-man" top a joke, by using material twice as heavy as it needs to be?

Rayntite has been on the market and in active service on thousands of cars for nearly two years. We have yet to receive the first claim under our guarantee.

Now Made in Two Varieties

RAYNTITE No. 1 Single texture with Fabrikoid surface

RAYNTITE No. 2 Single texture with Fairfield Rubber surface

Each is guaranteed one year against leakage.

If the car you are considering is not topped with Rayntite find out whether you or your wife can really handle the one-man top.

Samples of either variety on request

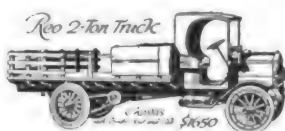
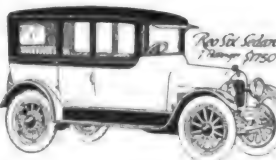
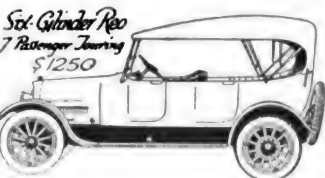
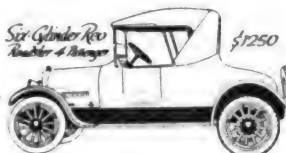
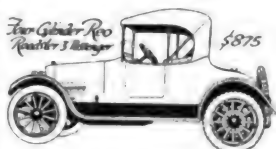
Du Pont Fabrikoid Company, Wilmington, Delaware

Works at Newburgh, N. Y. and Fairfield, Conn.

Canadian Office and Factory, Toronto



A Complete Line and —a Consistent Policy



CONSIDERED FROM THE dealer's standpoint, the Reo proposition is ideal.

THE SUCCESS OF REO DEALERS is conclusive evidence of that.

THE VERY TENACITY with which distributors and dealers hang onto the Reo line shows that experience bears out what deduction would indicate.

EVERY DEALER WANTS as complete a line of pleasure cars as possible. But in most cases this can only be secured by handling several different makes of cars, each representing a different—and frequently a contradictory—policy.

YOU HAVE TO DEAL with several sets of men whose ideas of business—of engineering—of manufacturing, and of selling—differ radically.

OR, IF YOU DO get a line of pleasure cars that covers different price classes, you find yourself talking one type of motor or principle in design to one customer, another to the next—and still another to the third!

YOU ARE IN THE POSITION of a preacher who tries to expound three doctrines—but can't segregate his audiences! What he tells one, all hear.

RESULT: HE "SELLS" NONE of them—they go to another church where the man can be consistent even if not sincere, in his adherence to one brand of theology.

THEN AGAIN: Nine times out of ten, when a concern makes several models you find that one model is always pulling—another dragging.

DOES THAT SOUND FAMILIAR?—No need to elucidate further to experienced automobile merchants on that point!

AND STILL AGAIN—in those rare cases where a maker does produce several models of pleasure cars that do not conflict—still you have to go to another maker to get a line of motor trucks.

AND MOTOR TRUCKS now are considered by all live dealers, a necessary part of a complete line.

THIS REO LINE COMPRISES motor trucks as well as pleasure cars—ten models in all. And every model a known, recognized—conceded—leader in its class.

NO REO MODEL DRAGS—none has to be pulled along by a more popular one. All Reos enjoy a chronic over-demand.

THE DEALER WHO HANDLES the Reos has, in reality, three complete lines—two of pleasure cars, each made in four models; and two motor truck lines, that, working separately or in unison, perform fully 80 per cent of all trucking service.

HE CAN GO OUT AND COMPETE with the best in these several lines—and feel he has the best made in all of them.

THIS LINE IS UNIQUE in that all models—trucks and pleasure cars—are designed by the same men; made by the same men; sold by the same organization.

THE REO LINE REPRESENTS the same ideas in engineering—the same ideals in manufacturing and merchandising.

WHEN YOU TALK REO you talk the line—every word you say about one model applies to all.

EVEN THE SIX AND THE FOUR do not conflict. The one is ideal for its purpose—a seven-passenger touring car or Sedan, or for a luxurious big touring roadster—that's the Six.

THE REO FOUR APPEALS to the biggest and best class of buyers, those who want a real automobile—a big, commodious, honest-to-goodness five-passenger motor car or business roadster—at less than \$1,000.

SO YOU SEE this line represents as none other does—none other, mind you—those factors every dealer desires in the line he handles.

AND ON TOP OF THAT it represents the highest ideals; the soundest policy; the best engineering, and the best quality throughout. That, every dealer knows.

WE SELDOM CHANGE, we Reo Folk. Never until we are convinced the present Reo representative never will measure up to the Reo standards. Or, as occasionally happens, to get one who will represent the full line instead of making it necessary for us to have two Reo men in the same territory.

IT'S A GOOD IDEA THOUGH to get, and to keep, in touch with the Sales Department. Things may be developing that you don't see on the surface, right in your own balliwick.

AND YOU MIGHT SECURE the plum—the best paying, because the Best line of automobiles and motor trucks made by one concern—backed by the same guarantee.

Reo Motor Car Company

Lansing, Michigan

174-A

All Prices are f.o.b. Lansing, Michigan

"THE
GOLD STANDARD
OF VALUES"

(When Writing to Advertisers, Please Mention The Automobile Journal.)

HAIL!

The Racing Champions of 1916.



**DARIO RESTA
JOHNNY AITKEN
EDDIE RICKENBACHER**

In all of their gruelling, nerve-racking races against time, the greatest factor they had to overcome was FRICTION.

DIXON'S GRAPHITE Automobile **LUBRICANTS**

WERE THEIR ABLE ASSISTANTS IN EVERY RACE



498 cars started in the 1916 races.

491 of these were lubricated with Dixon's Graphite Automobile Lubricants.

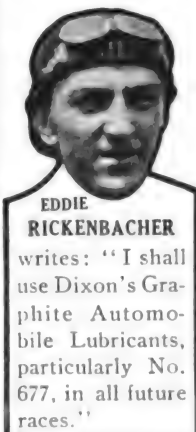
238 cars finished.

231 of these used Dixon's.

RESTA says—"Dixon's Graphite Automobile Lubricants give wonderful lubrication. I cannot praise them too highly."

JOHNNY AITKEN uses Dixon's exclusively.

EDDIE RICKENBACHER says—"I shall use Dixon's Graphite Automobile Lubricants, particularly No. 677, in all future races."



This is a little sermon that all car owners should profit by, and should be conclusive evidence that Dixon's Graphite Automobile Lubricants eliminate friction and prolong the life of every car.

Send for booklet No. 49 G, "Words of Wisdom From the Speed Kings."

Made in Jersey City, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY



Established 1827



THE Automobile Journal

VOL. XLII.

JANUARY 10, 1917.

NO. 11.



The Grand Court at Grand Central Palace, Showing Studebaker Gold Car in the Foreground.

World's Records Broken at New York Show.

More Car Makers and More Cars and Chassis Were Represented at the 17th Annual Exhibition Than in Any Previous Year—Four Absolutely New Makes and Eight New Models Were Disclosed for the First Time—Record Attendance.

"THE World's Greatest Automobile Show" was the popular verdict pronounced by both exhibitors and the general public shortly after the opening of the 17th annual New York automobile exhibition at Grand Central Palace. It was the greatest as regards the number of car exhibitors and of cars and chassis shown, as well as in point of attendance, which during the first few days averaged 25 per cent. more than in the record breaking year of 1916. While no definite figures have yet been announced, it is confidently predicted by Manager S. A. Miles that more than 400,000 persons attended the show during the week.

The show was one of the most beautiful and representative ever held in this country or in foreign capitals. The beautiful cars, among which closed

NEW YORK SHOW FACTS

97 Car Exhibitors
342 Cars and Chassis
226 Accessory Displays
144 Six Cylinder Cars
120 Four Cylinder Cars
48 Eights on Display
14 Twelve Models
13 Electrics
2 Steam Cars
4 New Makes Shown
8 New Models Displayed

types were conspicuous, both for their beauty and number, setting before a background of trailing flowers and massive marble columns, immediately gave the impression of quiet elegance. Touring cars predominated, of course, but it was noticeable that a great preponderance of car makers are tending toward making closed bodies standard features of their lines.

Of cars and chassis shown there were 342 on all of the four floors of the Palace, they representing the products of exactly 97 manufacturers. Last year there were 84 exhibitors of cars and 322 chassis and complete machines. In the accessory division this year the number of exhibitors was smaller than in 1916, the figures being 226, as compared with 306, but as a whole the accessory and parts displays were more representative and



One Part of the Main Floor, Showing the Decorative Scheme.

interesting than in any preceding year.

More six-cylinder than four-cylinder cars were on display, there being 144 as compared with 120 fours, while among the other types there were 48 eights and 14 twelves, two steamers and 13 electrics. In the accessory division there were more than 60 new devices, or new models of established lines, on display.

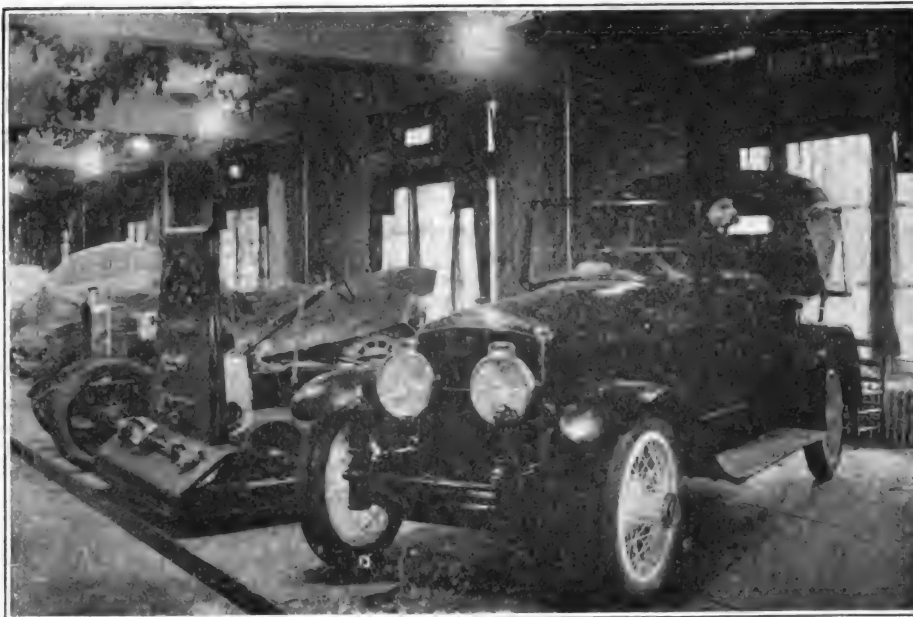
Four new makes of cars that had not been announced before the show made their appearance, while there were several other models that the public had read about, but had never seen. The four new ones were the Frontmobile, a front drive three-passenger roadster, built by the Bateman Mfg. Co., Grenloch, N. J.; the Majestic Eight, a new and distinguished appearing five-passenger touring model with a Victoria top, which is made by the Majestic Motor Co., 1790 Broadway, New York; the Dey Electric, a new Steinmetz product, exhibited by the Dey Electric Corp., 45 Broadway, New York, and the Puritan four-cylinder car, which carries a four-passenger Farman Nelson body of distinctive design, and is the product of the Puritan Motors Co., Framingham, Mass.

Among the new models offered by makers whose names are familiar to motorists, was the Willys-Knight Eight, which attracted much attention and is the latest product of the Willys-Overland Co. A new McFarlan Magnetic Six was exhibited, it being provided with a Vesta centrifugal and electric transmis-

sion that eliminates the use of the conventional separate lighting and starting system and places the control in a series of buttons carried on the steering column. The McFarlan is produced by the McFarlan Motor Co., Connersville, Ind. The Enger Motor Car Co., Cincinnati, O., displayed a new addition to its line, a four-cylinder model, selling at \$695, and intended for a companion car to its convertible twin six. Scripps-Booth Corp., Detroit, has added a four to its line of eights, and showed the first model in touring car form, which attracted considerable attention. Oldsmobile announced a new six-cylinder as a surprise, which now makes the line produced by the Olds Motor Works embrace fours, sixes and eights. Buick displayed a big six model, which bore all the characteristics of other models made by the Buick Motor Co., Flint, Mich. Another new model announced and displayed was an eight-cylinder Chevrolet, in four-passenger roadster and five-passenger touring

forms, the price being \$1385. The Pullman four, made by the Pullman Motor Car Co., York, Penn., was another model that made its first appearance before the show public, and it won instant favor. It sells for \$825.

Of all the novel power plants shown that of the Doble steamer held the greatest share of attention. All day long, and throughout the week, the factory representative at the booth was called upon to discuss the utmost technical points involved in the Doble steam car—and he seemed to convince every inquirer of



The Doble Steam Car, Which Attracted Throngs.



Pierce-Arrow Exhibit, the Highest Priced Cars at the Show.

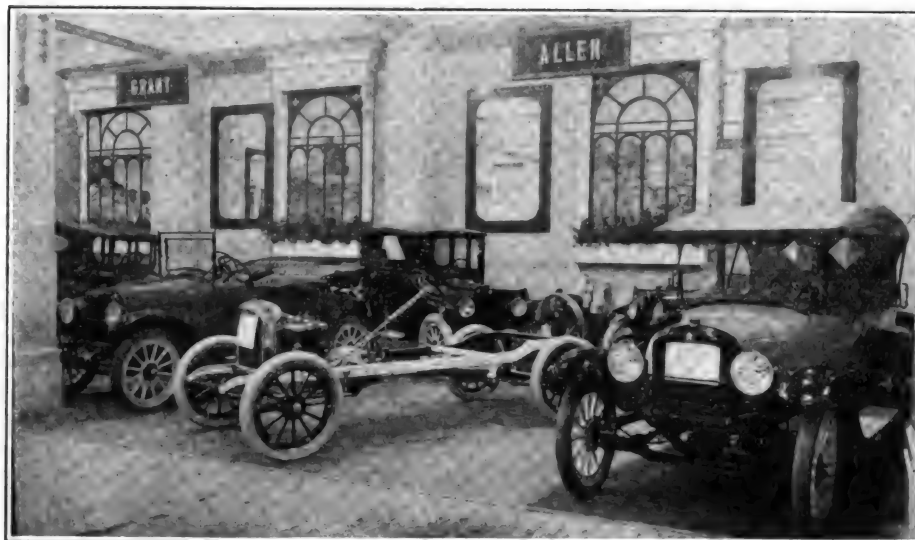
the value of the power plant. The car is the product of the General Engineering Co., Detroit.

The widely advertised Studebaker "gold car," which it is claimed cost approximately \$30,000 to produce, was surrounded by eager crowds. In its surroundings it made a handsome exhibit, not only because of its gold trim, but because of the excellent lines of the model. It carried a striking Victoria top that set off the balance of the car to the best advantage. Pierce-Arrow, Chalmers, National, King, Winton and other representative makes were the centres of crowds of visitors, all those named showing excellent closed "jobs," as well as open types, that were beautiful examples of coach work, which is described in considerable detail in another part of this issue.

Almost from the first hour of the show reports began to circulate about the large number of retail sales made, the big number of prospects secured and agency deals that had been negotiated. It was the consensus of opinion, both among the exhibit managers and the representatives of the factories, of whom there was an unusually large number, that the New York Show had become a great business convention, not merely a social function or a gathering place for makers and their representatives. As regards this last aspect, the practise still prevails, but has been overshadowed this year by the actual business done.



Regal's Exhibit, Where Many Sales Were Made.



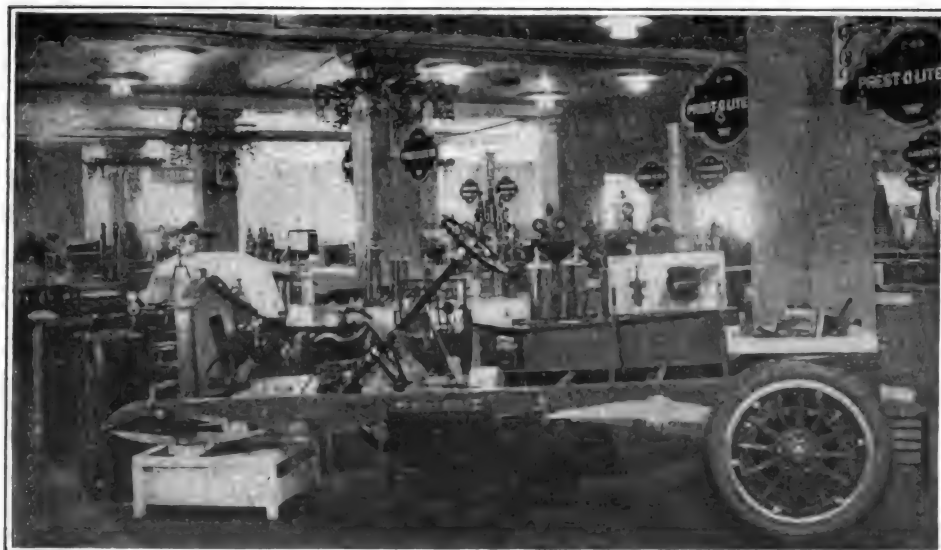
Allen Booth, One of the Most Popular Low Priced Cars.

In the accessory division there were many striking exhibits. A. R. Mosler & Co. had a huge spark plug mounted on a gun carriage to represent a cannon; Edw. V. Hartford, Inc., demonstrated its bump absorber by showing a car in miniature running against telegraph poles; the Champion Ignition Company showed a complete line of its A. C. spark plugs in an unusual manner; Findelsen & Kropf had a striking exhibit of its Rayfield carburetors, and Motor Meters were shown in all their various forms.

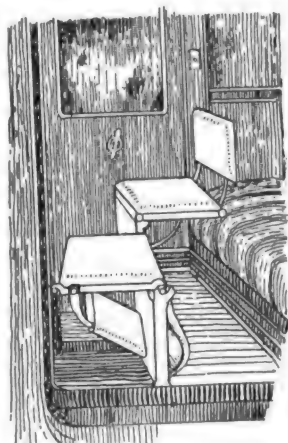
The maker of Weston garage testing instruments, which are for testing electrical systems, gave continuous demonstrations. The U. S. Lighting and Heating Corp. exhibited its batteries and demonstrated the many features that are characteristics of them. One of the new car heating devices shown was that of Moreau & Pratt's, which is known as the Victor.

The A. Schrader Co. displayed its full line of accessories, prominent among which was the new Schrader inflating valve that prevents leakage or abuse of air in free air service stations.

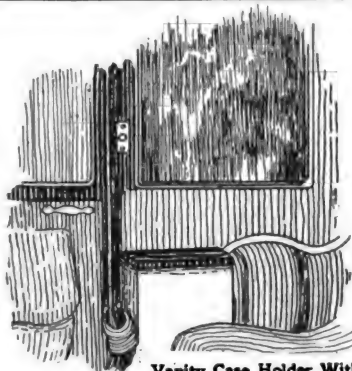
In the garage equipment division there were exhibits by the Black & Decker Mfg. Co., which consisted of a full line of air compressors and portable electric tools. The Brunner Mfg. Co. attracted much attention because of its arrangement of its air compressors, which were demonstrated to inquirers.



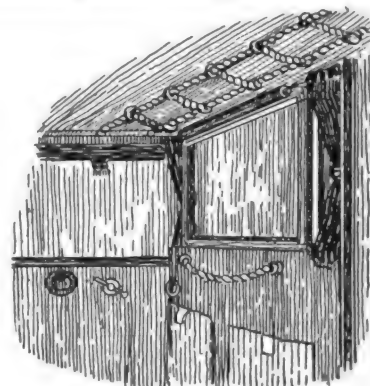
Prest-O-Lite Exhibition of the New Prest-O-Vacuum Braking System.



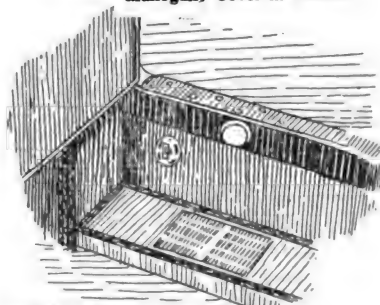
Hodge and Graves Two-Way Auxiliary Seats in Reo.



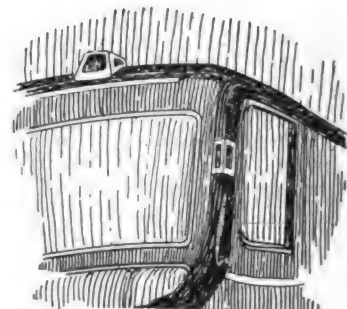
Vanity Case Holder With Mahogany Cover in Packard.



Convenient Hat Rack and Robe Carrier in Buick.



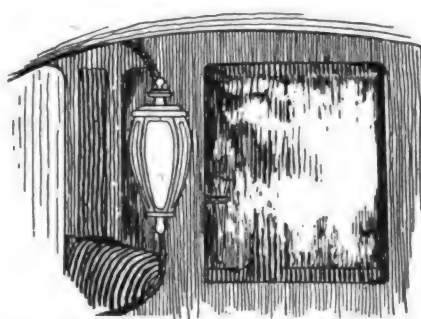
Step Light Arrangement On Paige Models.



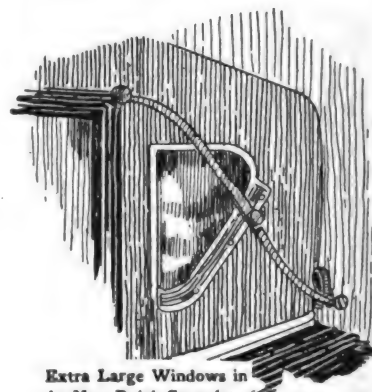
Unusual Type of Pillar Lamps on Chalmers Car.



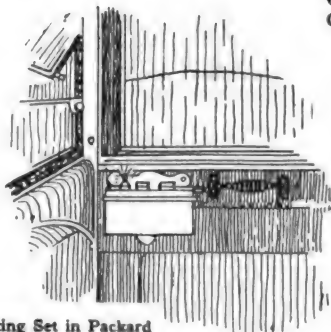
Storage Batteries Under Seat in Allen New Models.



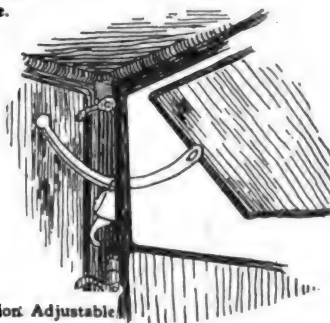
Ornamental Pillar Lamps On Winton Limousine.



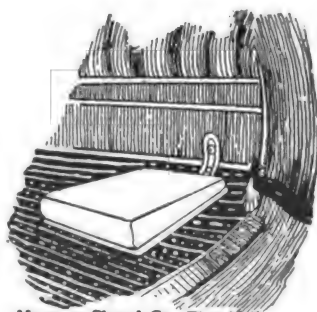
Extra Large Windows in the New Buick Coupelet.



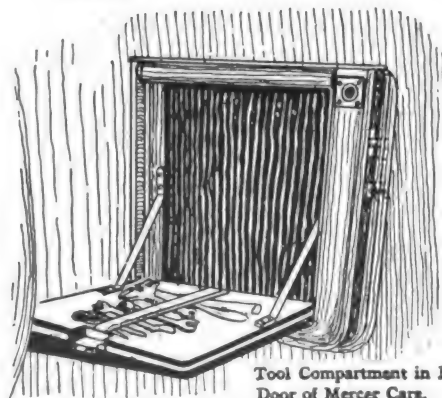
Smoking Set in Packard Enclosed Special Body.



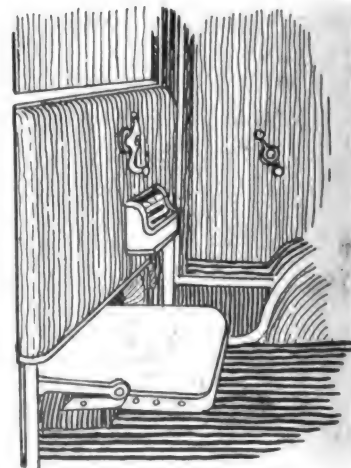
Double-Rain-Vision Adjustable Windshield on Reo Cars.



Marmon Closed Car Fitted With Comfortable Foot Stool.



Tool Compartment in Front Door of Mercer Cars.



Ideal Appointments in Liberty Brougham.

Striking Body and Interior Fittings and Appointments of 1917 Models at the Show.

New York Show Features Many Refinements.

The 1917 Exhibition Is Remarkable for the Wide Diversity of Those Details of Refinements and Interior Appointments that Improve the Appearance of the New Cars and Add to Comfort—Few Mechanical Changes Shown.

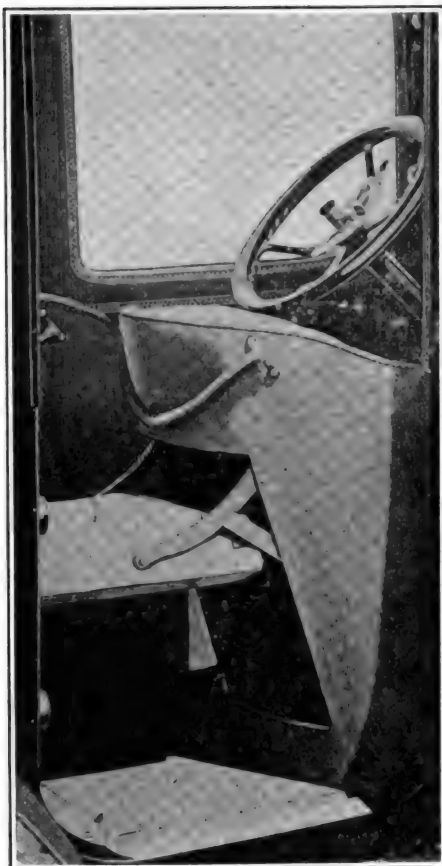
EPOCHAL developments in the automobile industry since its inception have been characterized mainly by radical changes in engine design and in body types and lines, but this year, while there are sporadic instances of new features in both respects, it is not the rule, and the impression that the show visitor gains is that of the numerous refinements included in the bodies and equipment.

Whereas the exhibits as a whole do not present changes that are indicative of any particular tendency in chassis or body development, fundamentally, there is hardly a single display that does not incorporate features of refinement that make for both the comfort and convenience of the passengers. The rearrangement of seats in more convenient locations and the use of improved devices for installing auxiliary chairs has resulted in a marked improvement in both appearance and comfort.

Fabric Upholstery Used.

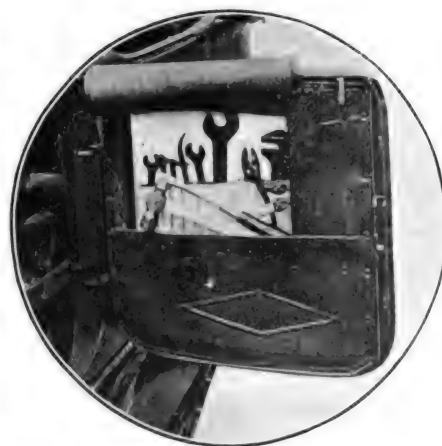
In the enclosed types these innovations have created a more chummy and comfortable "atmosphere" within the bodies, which has also been greatly enhanced by the more general use of fabric upholstery, lessening the effect of stiffness and rigidity produced by the heavy leather material. To crown these achievements designers have turned attention to the appointments and equipments, not only making them complete, but exercising care in their installation.

Special and conveniently located holders for articles of apparel are found in many models, and also vanity boxes and



Kissel Kar Featured an All-Year Sedan, in Which Auxiliary Seats Fold Into Back of Front Seats—Interior Finely Finished.

articles of service for men, such as cigar lighters and smoking sets. More suitable and handy locations have been found for the tool kits, spare tires and rims, luncheon outfits and other articles



Several of the Better Cars Had Tool Pockets in the Doors—This View Is of the New Paterson Car.

that are carried by up-to-date motor tourists.

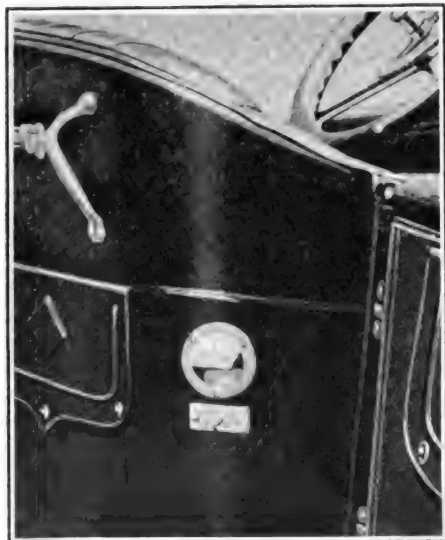
Advancement in special lighting effects is another outstanding feature of the new models, hardly a manufacturer having overlooked the opportunity of improving the lighting installation in his product. The tendency in this respect has been toward increasing the number of lighting units. On the enclosed models many novel adaptations are found of the dome light. While many retain this light in its conventional position, they have also added reading lamps, located either at the corners in the rear of the bodies or in the centre over the rear panel windows. The step light is found both on the outside just above the running board and on the inside in the side of the back of the centre cowl, fitted with reflectors to concentrate the rays of light upon the step.

Pillar Lights Popular.

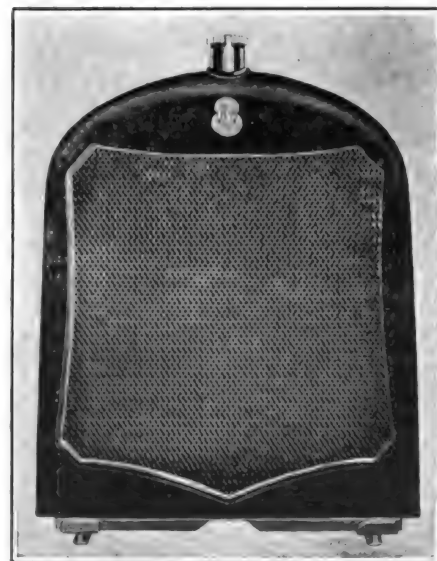
Several of the higher priced makes have been fitted with pillar lights for a number of years, but for 1917 many of the lower priced limousines on exhibition are equipped with this style of lamp. Some of the lights are installed flush with the body, being set in metal boxes on either side of the windshield about half way between the cowl and top. In the bracket pillar lamps many exquisite designs have been worked out with a suggestion of Colonial effect.

Much ingenuity is shown in the trouble lamp equipment in a number of models.

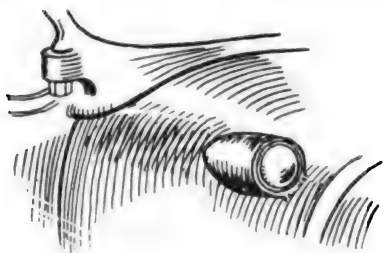
(Continued on Page 37.)



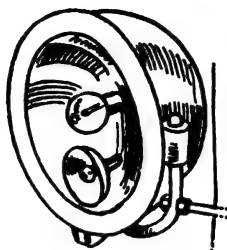
The New Oldsmobile Eight Has a Combined Tonneau and Step Light and Auxiliary Seats That Are Covered by a Flap.



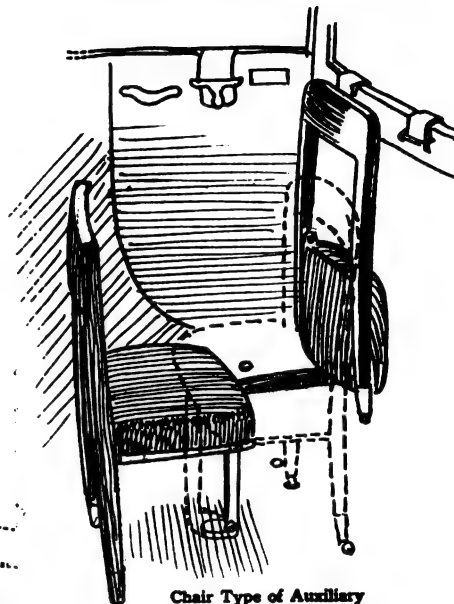
This is the Fedders Radiator on the New King Series EE, Just Announced—The Name Plate Has Also Been Changed.



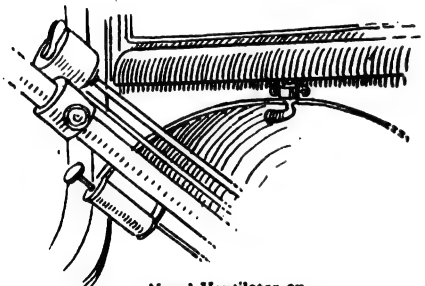
Bull-Eye Cowl Lamps
On New Daniels Models.



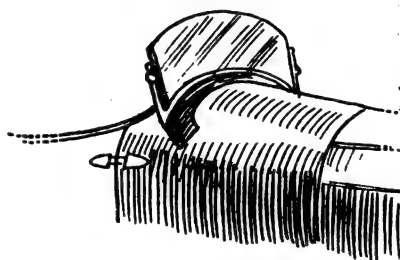
Auxiliary Reflector in
Kissel-Kar Head Lamps.



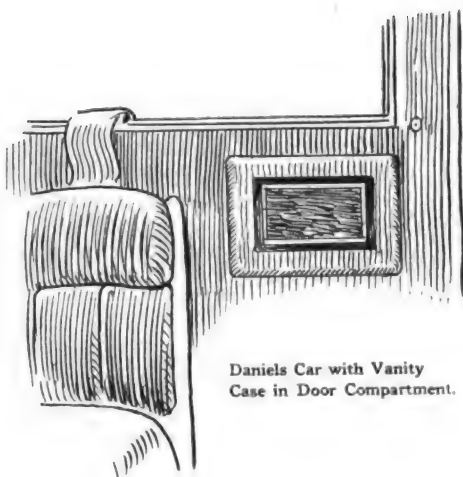
Chair Type of Auxiliary
Seats in Lexington Models.



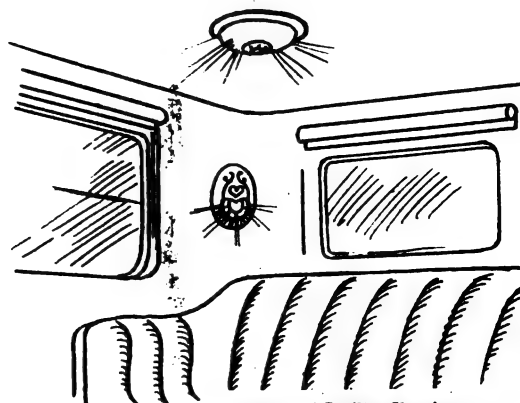
Novel Ventilator on
Packard Enclosed Car.



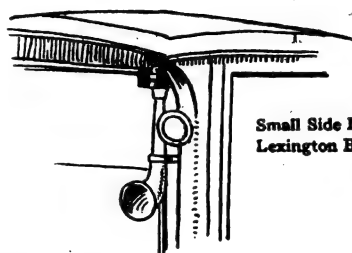
Gracefully Curved Windshield
On New Novara Runabout.



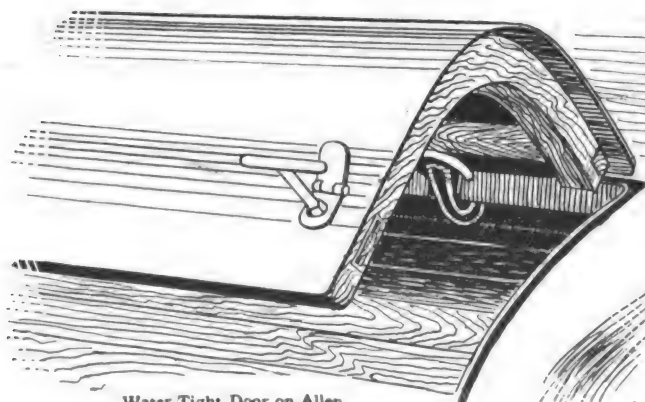
Daniels Car with Vanity
Case in Door Compartment.



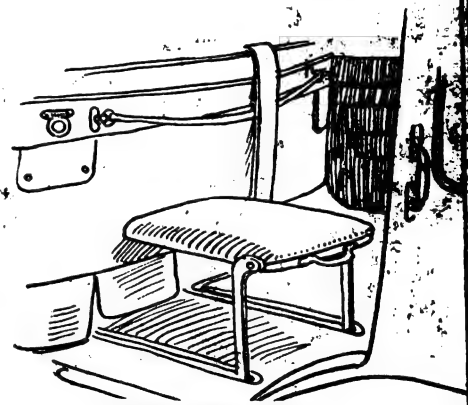
Interior of Cadillac Showing
Unique Reading Lamp and Fixture.



Small Side Lamps on Enclosed
Lexington Bodies.



Water-Tight Door on Allen
Rear Deck Compartment.



Folding Auxiliary Seat of
Special Type in Kissel-Kar.

Striking Body and Interior Fittings and Appointments of 1917 Models.

Women in the Car Industry

WHEN the women of Europe took up the work of producing ammunition and munitions, as well as the necessities of life, while their brothers, husbands and fathers were fighting at the front, the world was unstinting in its admiration of their ability to carry on the work. To many it was the first proof they had received of the talent women possess for handling and operating machinery and tools.

In the automobile industry of the United States women and girls have long demonstrated their fitness for certain lines of factory work, and today there is scarcely a motor car plant that does not employ women in the production of motor vehicles. No class of work seems to be too hard or complicated for them, and in the matter of assembling small and delicate parts employers generally declare they are superior to men.

During the past summer when skilled male labor was exceedingly scarce, many women and girls obtained their first opportunities to demonstrate their fitness in helping to produce automobiles. Once in the ranks they quickly established themselves until now they have become a part of the organizations and will not be replaced by male help on account of their inability to compete with their brothers.

The Chalmers Motor Co., Detroit, Mich., is a good example of the foothold women have secured in the industry, the photographic illustrations on this page showing "Chalmers Girls" at work at their daily duties. At the top of the page is a view of one feminine inspector, who is carefully examining carburetors before they can be passed on to be incorporated into a car. As inspectors women have been found to be exceptionally efficient.



A Feminine Inspector of Carburetors.



Testing Parts with a Micrometer.

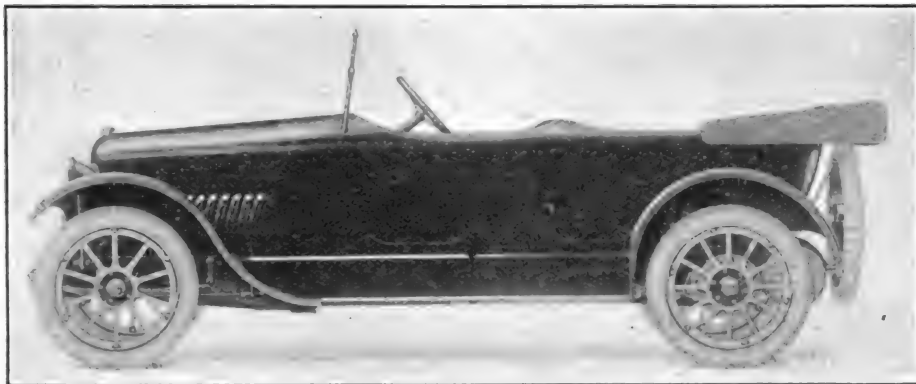
The view in centre of the page shows another inspector who evidently is proficient in the handling of a micrometer. In the work of assembling small parts, as the girl in the upper left hand view in the group illustration is doing, employers have found women to be exceedingly skillful. Complicated machinery is easily mastered by some women industrial workers, as the view at bottom of the group would indicate.

The first work taken up by women in the industry was that of the top making department, and the large view in the group shows a top and side curtain department in the Chalmers plant. This class of work is just suited to the feminine nature manufacturers have found.

Women are especially prized for their efficiency in assembling all wiring for cars, of primer systems, switches, inspection of pistons and other small parts and drill press work.



The Parts Women Play in Producing Chalmers Motor Cars.



The New Elgin Six Touring Model.

FOR 1917 the Elgin Motor Car Corp., Chicago, Ill., has brought out a new six-cylinder model to sell for \$985. This is an entirely new car, its wheelbase being 116 inches, as compared with 114 of last year. The body is swung low and appears rakish, as did the 1916 model, and a centre cowl has been added.

One outstanding feature of the new Elgin is the spring suspension, the rear springs being full cantilever and swung beneath the frame in a manner that is said to be new. The frame of the new model has been made much heavier, with a cross member, and it tapers toward the front to provide short turning radius and to give stability and prevent frame stress.

Details of Bodies.

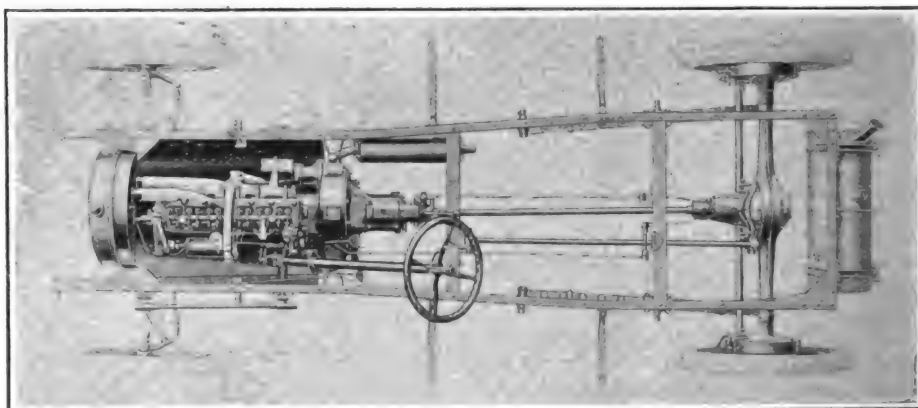
The touring body, a full five-passenger "job," has the popular yacht lines, with centre cowl, and is upholstered in bright finished, long grained Galloway leather laid in French pleats. The standard color is dark royal blue, with black hood, radiator, fenders and running gear. The wheels are finished in light cream color with black striping.

The new four-passenger roadster has lines similar to those of the touring car, the same type of upholstery and is finished in Elgin gray, with black running gear, fenders and radiator and cream colored wheels striped with black. The backs of the seats rise over the deck in a continuous unbroken line, and the rear seats are reached from the front compartment through an aisle way.

These bodies are mounted on a new chassis, in which is a Falls valve-in-head six-cylinder engine, the same type as was used by Elgin last year. This year, however, the intake manifold has been

eliminated and the carburetor, which is a special one-inch Stromberg type with hot air connection, now bolts direct to a flange cast on the cylinder block. The intake is integral with the cylinder head, as is the exhaust manifold.

The engine is rated by Elgin at 30-35 horsepower, the bore being three inches and the stroke $4\frac{1}{4}$. It is cast in block with valves located in the cylinder head, which is removable. The crankshaft is carried on three bearings, as is the cam-



Details of the Stripped Chassis.

shaft, which is driven by spiral gears.

Lubrication and Cooling.

Lubrication is by the forced feed and constant level splash system, and cooling is accomplished by the thermo-siphon system and a large fan and V shaped cellular radiator.

The electrical installation includes a Remy vertical shaft outfit for ignition and a Wagner two-unit for starting and lighting, operating with Bendix pinion engagement and Gardiner battery.

The engine is mounted in unit with the clutch and transmission, with three-point suspension, the third point in front being a large bearing concentric to the crankshaft.

The clutch is a Borg and Beck single dry plate disc type. The transmis-

Elgin Produces Wheelbase To Supplement

sion gearset is the three-speed forward and reverse selective type, with nickel steel gears and large annular ball bearings. Power is transmitted to the rear through double universal joints on a propeller shaft consisting of $1\frac{1}{2}$ -inch diameter alloy steel seamless tubing.

Full Floating Rear Axle.

The rear axle is the full floating type and on back of the housing of pressed steel is a large cover plate. Torsional strain is taken care of by the latest development in torque arm, which is of unusual strength. Brown-Lipe-Chapin dif-

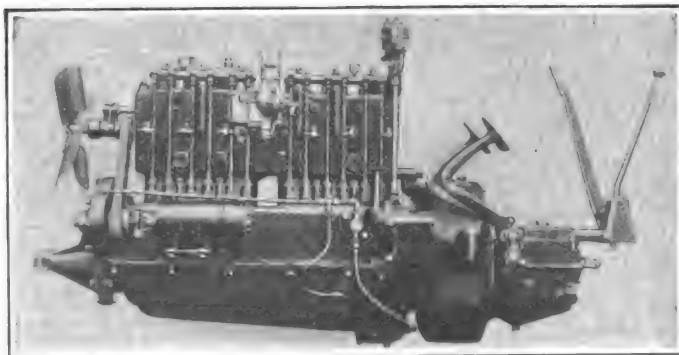
ferential spiral gears of the four-pinion type run on large annular ball bearings. The standard gear ratio is $4\frac{1}{2}$ inches to one. The drive shafts are $1\frac{1}{4}$ inches in diameter and carry flanges on the outer end, which bolt directly to the rear wheel hubs. In these hubs are large annular ball bearings.

The rear wheels, which like the front, are 12-spoke artillery type, carry 12-inch brake drums on which operate the external contracting service brakes and the internal expanding emergency brakes.

The wheelbase, as mentioned before, is 116 inches and the tread the standard 56 inches. The front springs are semi-elliptics and the rear full cantilever. The spring grease cups are integral. At the rear of the chassis is a cylindrical gasoline tank with capacity for $15\frac{1}{2}$ gallons and provided with a gauge. Gasoline feed is by vacuum.

U. S. Tires Used.

Tire sizes are 33 by four inches front and rear, and the standard make supplied is the U. S. plain tread in front and chain tread in the rear. The rims are



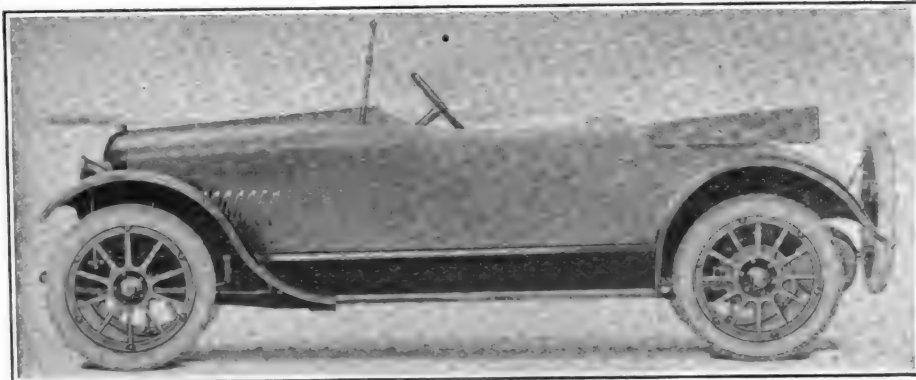
The Falls Engine Used by Elgin.

A New 116 Inch Six Model the 1917 Series

the new type Stanwell, quick detachable and demountable, and one extra rim is included in the standard equipment.

The steering gear is of the worm and full gear type, ball thrust, with automatic take up ball and socket drag link connection between steering arm and arm on front axle. The steering wheel is an 18-inch corrugated type, carrying spark and throttle levers and horn button. The foot accelerator is on the toe board and the brake and gear levers in the centre of the compartment.

The standard equipment includes a one-man Neverleak top with Jiffy curtains, Stewart speedometer, charging indicator, dash lamp, ventilating wind-



Elgin's New Four-Passenger Roadster.

LUBRICANTS USED BY RACERS DURING 1916.

In an analysis of the races and cars of the 1916 season recently issued by the Joseph Dixon Crucible Co., Jersey City, N. J., there is much of interest to operators of cars. This company finds that of the 498 cars which started in the 37 races held under the auspices of the A. A. contest board, 491 were lubricated with Dixon's graphite lubricants. Only

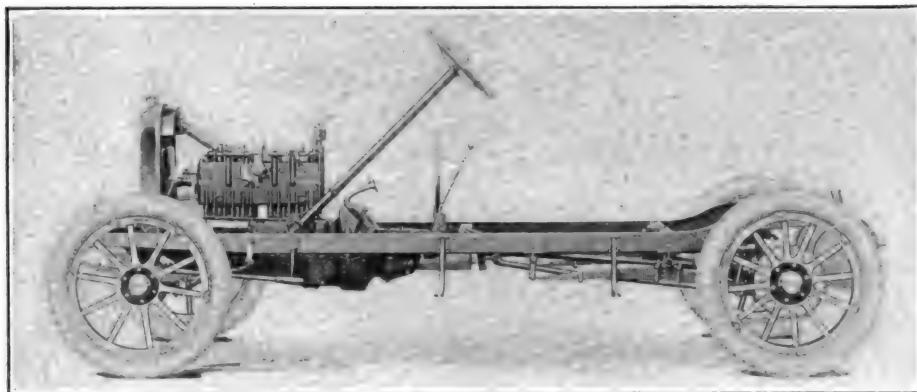
the Dixon company declares that the men using its products did so wholly on the merits of the lubricants, there being no other influence exerted in that direction.

Racing affords an excellent opportunity to judge the merits of the cars competing and the equipment with which they are provided. Any component or accessory that comes through the season with high honors can rightly be judged a glowing success. The contests are alike gruelling to the men, the cars and the accessories, and that the drivers are almost unanimous in using Dixon lubricants is to be considered an exceedingly high indorsement.

PHILADELPHIA SHOW LARGEST ON RECORD.

The automobile show at Philadelphia, which will be held in the Commercial Museums building during the week following the New York show, will be the biggest ever held in that city. The demand for space exceeded the supply even after arrangements had been made to greatly increase the available room for exhibits. Some of the cars will be shown in spaces originally intended for accessory displays, as additional room for the latter department has been provided in the balconies.

A new elaborate heating and electric lighting equipment is being installed in the building, which will greatly improve its appointments for exhibition purposes, and a striking and original decorative scheme has been worked out by Philip S. Tyre, architect in charge of the decorations. The show opens Jan. 15 and closes on the following Saturday evening, Jan. 20.



The Elgin Wheelbase is Now 116 Inches.

shield, electric engine driven signal horn, extra tire rim, coat and foot rails, tools, pump and tire repair outfit.

HASSLER MOTOR CO. LAUNCHES NEW CAR.

The Hassler Motor Company, Indianapolis, Ind., will display the new Hassler car at the Chicago automobile show for the first time and announces that deliveries to dealers will commence about Feb. 1.

It is an assembled product with a Buda four-cylinder $3\frac{1}{4} \times 5\frac{1}{2}$ engine. The chassis is fitted with double cantilever springs front and rear, Houk wire wheels with 33x4 cord tires. A Grant-Lees transmission gearset of the heavy car type is used with Brown-Lipe driving gears. Both Timken and Hyatt bearings are used. The engine is equipped with an Auto-Lite, Bendix drive type, starting, ignition and lighting system.

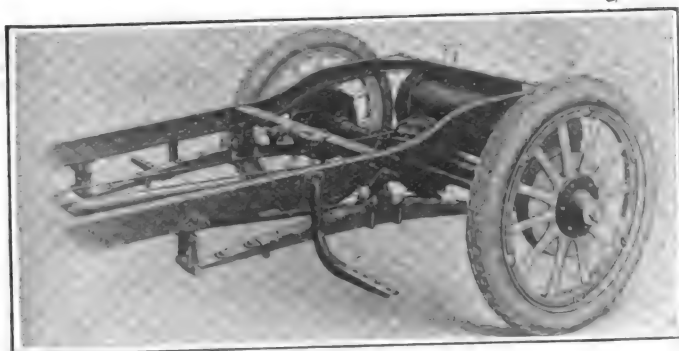
At present the production will be confined to the roadster model, which has a streamline body with exceptionally roomy, staggered seats. The color finish is optional with the purchaser.

238 of these cars finished and of that number all but seven used the Dixon product, and 112 of the 113 racing drivers used the same lubricants.

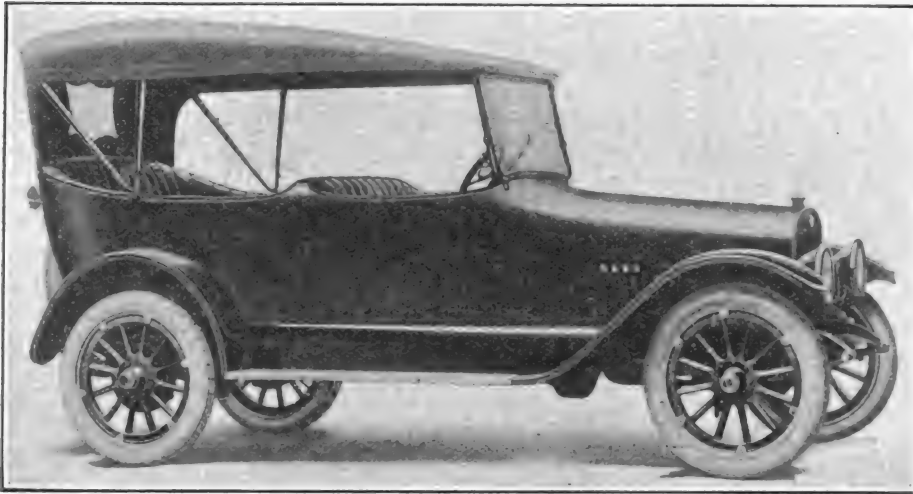
The year's champion racing driver, Dario Resta, and John Aitken, the runner up, as well as Eddie Rickenbacher, who won third honors, earned 10,450 of the total of 22,720 points awarded by the A. A. A. These three men used Dixon's graphite. The winning cars that were lubricated with Dixon product traveled 4795.55 miles, at an average speed of 87.87 miles an hour, including road as well as speedway contests.

Resta's and Aitken's Peugeot cars, which they drove throughout the season, using Dixon's graphite, came in first in 15 races, and the average speed made was 96.92 miles per hour.

In calling attention to these records



View Showing New Cross Member.



Paterson Five-Passenger Six-Cylinder Touring Model for 1917.

THE W. A. Paterson Co., Flint, Mich., has announced for the 1917 season a newly designed chummy roadster and five-seven-passenger touring model, both bodies being mounted on the standard Paterson six-cylinder chassis, which has not been changed materially over that of last year, with the exception of refinements and improvements in details. For several seasons the Paterson company has concentrated on one model, but a demand for a roadster has resulted in the new type four-passenger close coupled chummy model.

Double Cowl Added.

The 1917 touring car has been refined in several details, although in the main it is similar to that of 1916. The body has been provided with a double cowl and given a more decided streamline effect. It is also somewhat longer and wider, giving a greater amount of seating and leg room. While the touring car is catalogued as a five-passenger machine, there are two auxiliary seats which makes the car a comfortable seven-passenger vehicle.

One of the features of the new Paterson is the manner in which the side curtains are carried in the top of the car. They fold up neatly and fit snugly in place without any pulling or stretching. Another body feature is a tool pocket in the front left hand door, each tool being in its individual compartment. In addition to the usual tools there is a trouble lamp with 15 feet of cord.

The chassis, which has a wheelbase

of 117 inches, includes a six-cylinder Paterson-Continental engine with bore of $3\frac{1}{4}$ and stroke of $4\frac{1}{4}$ inches, which by the S. A. E. rating develops 25.35 horsepower. The engine is an L head block casting and its piston displacement is 224 cubic inches. Valves are placed on the right side, and the crankshaft is mounted on three plain bearings. The timing gears are the helical cut type.

Carburetion is by a Stromberg instrument, fuel feed being by gravity from a gasoline tank carried in the rear of the chassis, with a gauge provided. Lubrication is by the forced feed and splash system, the pump being a plunger type and the lubricant being splashed to the working parts by means of scoops on the ends of the connecting rods.

The cooling system is of the pump type, aided by a large belt driven, four-blade fan and a tubular radiator of the conventional design.

A Delco electrical system is used for ignition and starting and lighting. A feature of the lighting system is that the electric dash lamp and the tail light are connected in series, so that if the latter

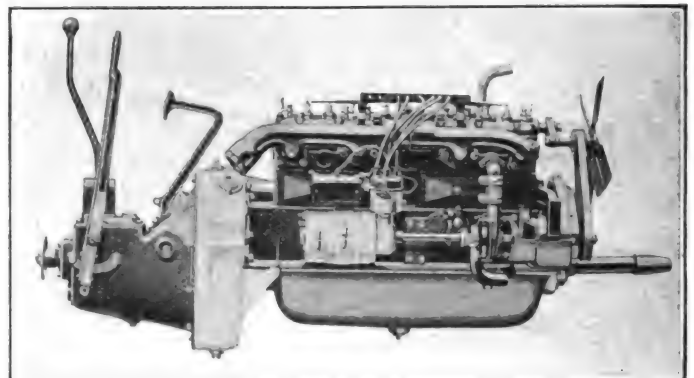
Paterson Adds To Its 1917 Two Models On

should fail to work the dash light will instantly go out, indicating that there is trouble in the rear. Willard storage batteries are used. The generator and distributor are carried on the right hand side of the engine block, which is suspended at three points and is in unit with the clutch and transmission gearset.

Hotchkiss Drive Used.

The clutch is a conventional cone design and the transmission gearset of the three-speed forward and reverse selective sliding gear type. Power is transmitted to the wheels through the Hotchkiss drive system. There are two universal joints and a tubular propeller shaft. Propulsion is through the rear springs.

The rear axle is of the conventional full floating type. The axle housing is



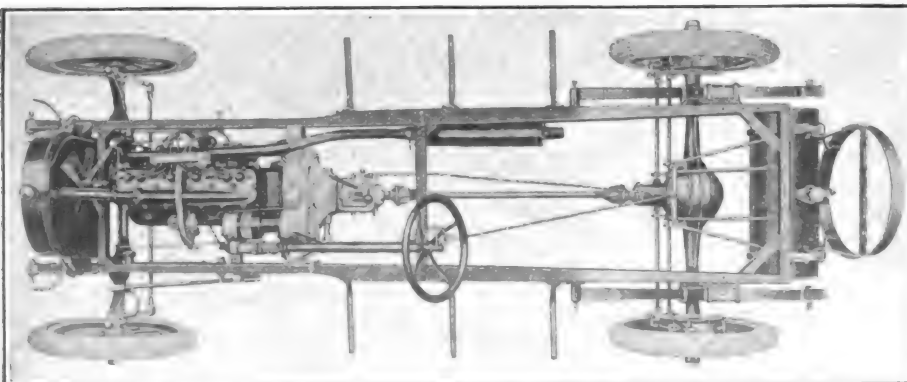
Unit Power Plant of Paterson Six-45.

of pressed steel and at the rear is a removable cover. The gears are nickel steel and of the spiral type, and are mounted on high-grade annular ball bearings. The drive members, that is the pinion shaft and the drive shaft, are of heat treated chrome nickel steel. The standard gear ratio is 4.50 to one. The front axle is an I beam section.

The rear springs are of the $\frac{3}{4}$ elliptic design and the frame curves upward over the rear axle, allowing the body to set quite low. The brakes are of the conventional external contracting and the internal expanding type, operating upon generously large drums.

The artillery type wooden wheels have demountable rims and carry 32 by four-inch Goodrich tires, Safety Tread on the rear. An extra rim is carried in the rear of the chassis and is conveniently located for mounting a spare tire. The weight of the car completely equipped for the road is approximately 2700 pounds.

The Paterson company lays special stress on the character of the standard-



The Paterson Chassis Is Rugged Yet Neat.

A New Roadster Line Making A Six Chassis

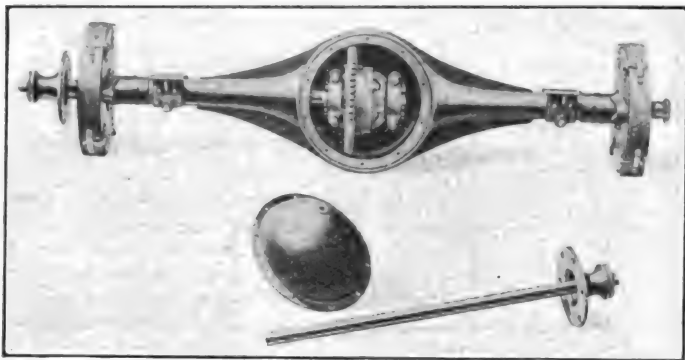
ized components used through the chassis, as the names in the foregoing paragraph will indicate.

Included in the standard equipment provided with the car is a Stewart-Warner speedometer, an electric horn, full ventilating rain vision windshield, a one-man top with a neat dust hood, and a full tool equipment.

The Paterson touring car, model Six-45, five-passenger, is priced at \$1095, and the roadster, model Six-45R, sells at the same price.

INSURANCE ADJUSTERS AIDED AUTO THIEVES.

An investigation made by State Attorney Hoyne of Illinois uncovered the fact that insurance adjusters had been working with automobile thieves in both de-



Full Floating Paterson Rear Axle.

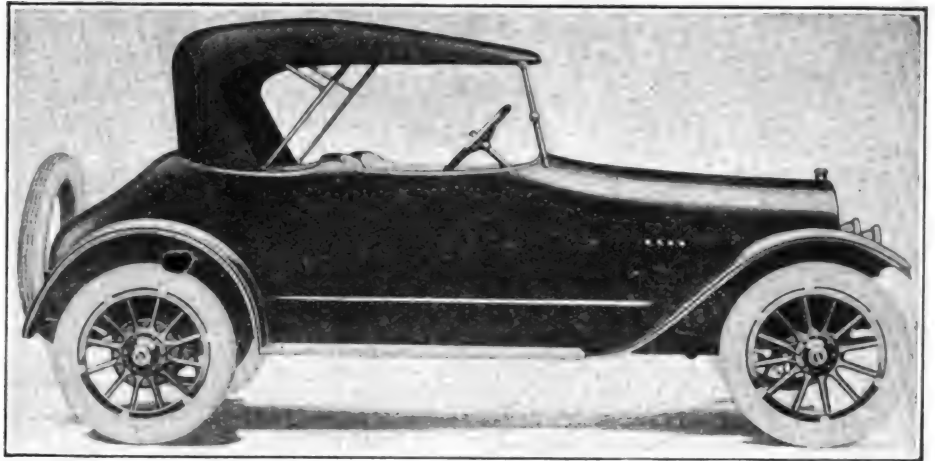
frauding the insurance companies and also in obtaining money from car owners.

One plan employed was to steal a heavily insured car and conceal it until a large reward was offered. If the amount offered was practically as much as the thieves could get by selling the machine, they returned the car and claimed the reward.

The thieves also worked in conjunction with the adjusters by stealing a heavily insured car, selling it to an innocent party and then telling the adjuster where the car was located. In this way they obtained the reward from the owner and insurance company and also kept the money obtained by the sale of the car.

TRACTOR MUST REPLACE HORSE, SAYS SLOAN.

A. P. Sloan, Jr., general manager of the Hyatt Roller Bearing Company and president of the United Motors Corporation, in the course of an address at the annual sales conference of the tractor



Paterson. Four-Passenger Close Coupled Chummy Roadster for 1917.

bearings department of the Hyatt company, expressed his faith in the future of the tractor industry and stated that it naturally follows that the tractor must replace the horse if farm production is increased to a point where enough food stuffs are raised to supply the country with its rapidly increasing population.

"Farm production, or more specifically—the raising of food stuffs—is largely a question of power," said Mr. Sloan. "The combined horsepower used on farms amounts approximately to 30,000,000, which is more than the combined horsepower of all other industrial power plans.

"It is estimated that farm lands are producing only 40 per cent. of their potential capacity and that this production can be increased at least 50 per cent. by having sufficient power available. Although horses are now the chief source of power for farm work, it is unreasonable to believe that they can meet the demands for power. It naturally follows, therefore, that the tractor must replace the horse.

Tractors, to accomplish this, must be more scientifically constructed; they must be more efficient. The farmer wants greater reliability, he wants the

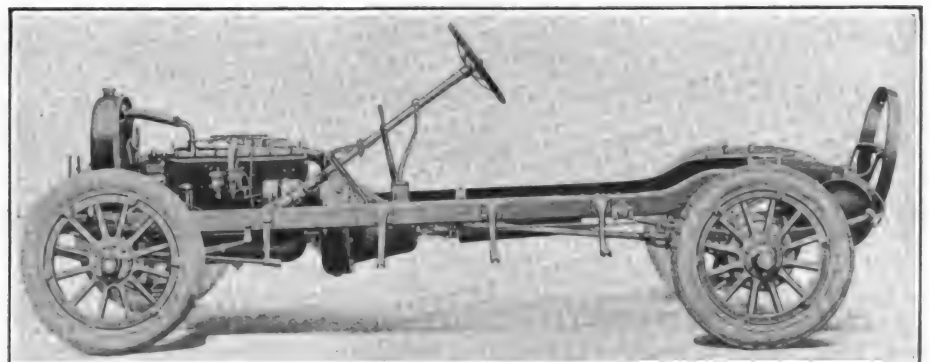
maximum power delivered to the draw bar. He can only get greater power at the draw bar through the elimination of friction, and other causes which consume power and are unproductive. Anti-friction bearings in tractors go a long way towards giving the farmer greater reliability and more power."

The guests of Mr. Sloan at the dinner were: C. M. Eason, manager of Chicago department; H. O. Kuechenmeister, assistant sales manager; F. A. Dean, chief draftsman; J. R. Bateman and O. W. Young, sales engineers; T. A. Russell and C. E. Stoddard of the engineering department; L. S. Newman, mechanical inspector; J. E. Martin, engineer of tests; H. M. Carroll, advertising department, and H. T. Ewald, advertising counsel.

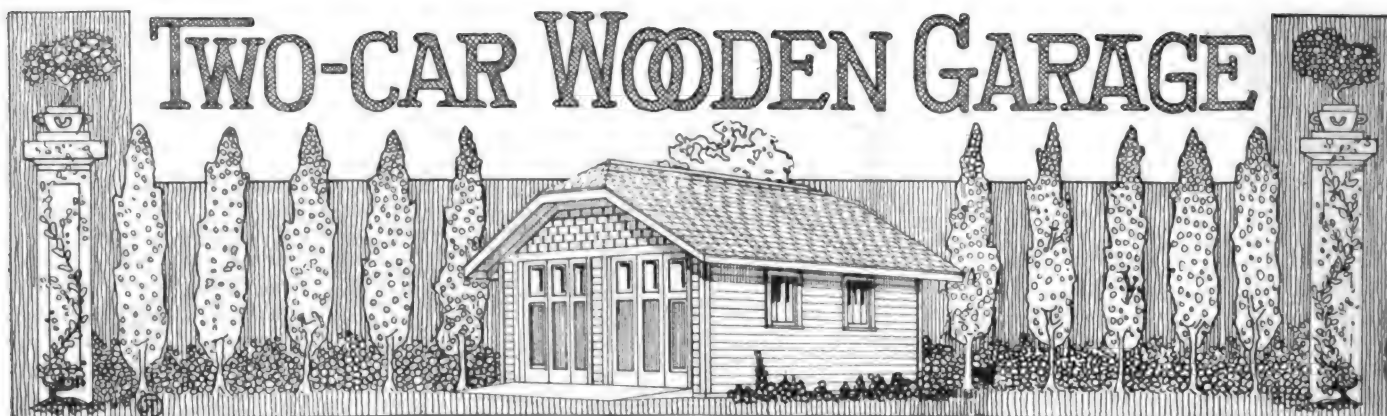
A. L. A. WILL START A WEEKLY PAPER.

The Automobile Legal Association, starting the first week in February, 1917, will issue a paper called the "New England Motorist," to supply the members of the organization with more information than they have been receiving through weekly letters.

A department of highways is also being opened by the association for the purpose of extending aid to the different towns in New England who do not employ a road engineer. Sidney S. Von Loesecke, recently of the Boston Transit Commission, will co-operate with the selectmen of the different towns and will help in road planning free of charge.



Side View of Stripped Paterson Chassis.



IN THE late summer and early fall issues of Automobile Journal appeared a series of articles on the construction and equipment of concrete, brick, tile and cement-stucco garages. Widespread attention was attracted by these articles and their publication was followed by numerous inquiries regarding other types. Those types were dealt with and favored because it seemed the greater interest was shown in them. Since then there has been many inquiries regarding details of construction and arrangement of the wooden garage.

In planning such a building the same fundamental rules should govern the builder's course of action as applying in the case of any type. After deciding whether it is advisable to build accommodations for two or more machines, instead of one, care should be given the type of design to be employed so that the structure will conform to the architectural lines of the surrounding buildings.

The additional cost of making the building sufficiently large for two machines is but a small proportion of the cost of a one-car garage, and, inasmuch as it doubles the investment value, the double type is preferable unless special circumstances obtain to make it inadvisable or in case where the property upon which the garage is to be erected is so isolated that there would be no demand for garage space. At prevailing

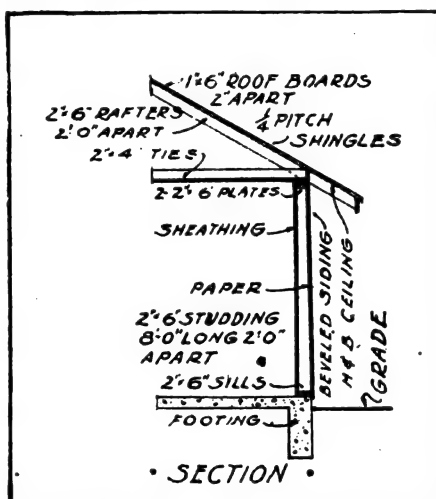
rental rates and big demand for garage space in all closely built up sections, the double type, properly constructed and maintained, can be erected as a big paying investment or made to shelter the owner's car at no cost to himself and still return him better than bank interest on his money.

Having disposed of the preliminary arrangements, the builder should keep in mind the facts that cheapness in material and labor employed will neither prove profitable in the long run or eco-

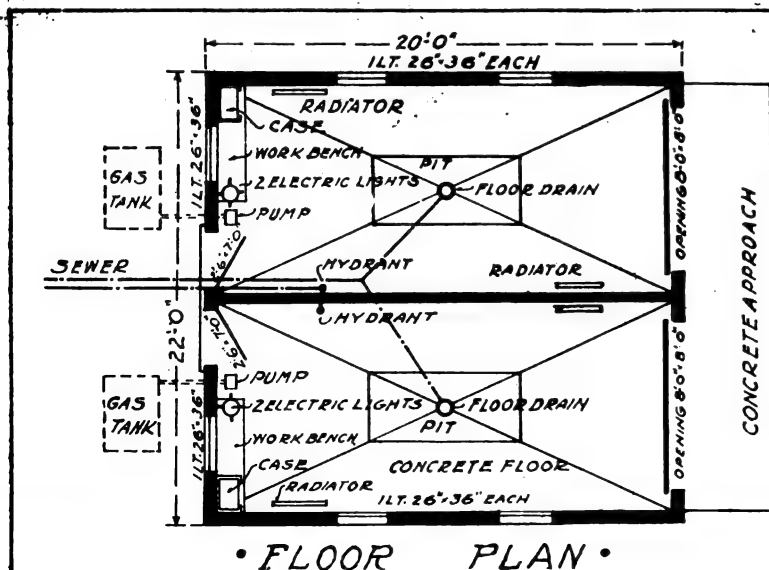
nomical, and that a reliable builder—if the work is to be let out—will be found the cheapest, everything considered. Good workmanship, with good wood, hardware and paint, will produce a structure that immediately enhances the value of the estate, is more readily let or sold and will give the owner less trouble and expense in the years to come.

Creosoted posts, brick or concrete piers are used as a foundation and should also be placed under the stringers supporting the floor, if of wood, where the wheels of the machine rest. It is not necessary to give construction details other than those shown in the accompanying plan, as any builder would be thoroughly conversant with the details. A concrete floor will be found more enduring and serviceable than a wooden floor, and will make a neater job.

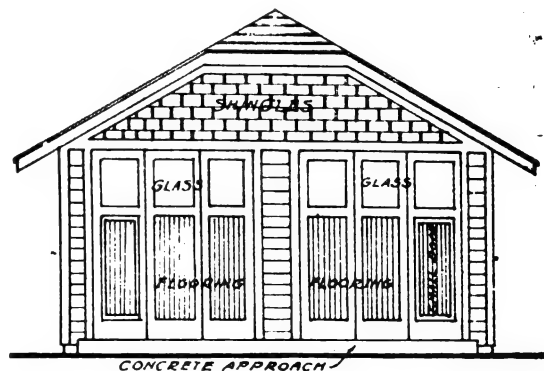
Much care, however, should be exercised in installing the equipment, and this work would fall to the owner. In climates where low temperatures prevail throughout a portion of the year, it is a good plan to sheathe the inside of the walls and ceiling as a means of conserving the heat. Regardless of the type of heating arrangement employed, the economy effected by the double walls should pay for the additional cost almost in one season.



Section Plan for Building Two-Car Wooden Garage.



Building Specifications and Layout of Equipment, with Front Elevation Plan.



• FRONT ELEVATION •

Another economical device that should be installed is the underground gasoline tank outside of the garage with pipe leading into the building. The gasoline by this method is not only stored in a safe place, away from the building and danger of becoming ignited, but it enables the purchaser to buy in wholesale quantities with the advantages of wholesale prices, which will effect a saving of many dollars in the course of a year.

A pit large enough for a person to lay in to fix or adjust parts underneath the car should be constructed in the floor, with a drain at the centre of the bottom, connected with the sewer.

Connection with the public water system, or what is better, connections with the water system in the house, is very

desirable, as water is needed in a garage for many purposes. It is convenient for filling radiators, washing the car or cleaning one's hands after working about the machine. The connections with the system in the house, affording both a hot and cold water tap, would cost but little more than a connection with the street mains and installation of meters, and has sufficient advantages to offset the extra outlay involved.

If electricity is to be used in lighting the garage and only one socket is to be installed, the most convenient location for it is over the work bench. A two-socket fixture should be used, one for a permanent bulb and the other for a trouble lamp, with extension cord for use underneath the cars and in sections in shadow.

The work bench is an indispensable fixture in the garage and should be at least six feet in length and from 12 to 16 inches wide. The front board of the bench proper should be made of a 2x6 or 2x8 plank, making it heavy and rugged enough to hold a vise firmly and to stand the pounding that is often necessary. Besides the two supporting frames at the ends there should also be one in the middle, made of 2x4 joist. Cross braces on the legs can be used to support a shelf which will prove useful for storing materials and tools.

Descriptions, designs and plans of a cheaper two-car garage, single garages and community garages of wood, as well as suggestions for tools and equipment that will be found valuable, will be given in following numbers of this magazine.

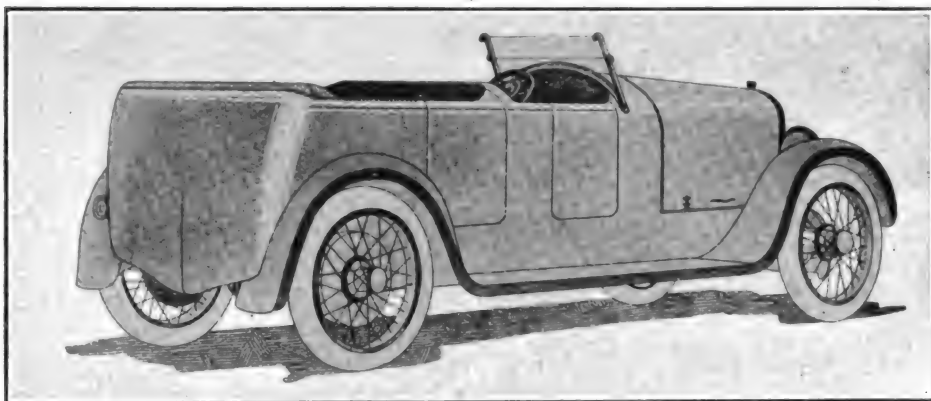
No-Man Top Raised and Lowered Automatically

A TOP that can be raised or lowered mechanically by simply operating a lever at the driver's side is one of the latest developments to be divulged this year. It is designated as the "No-Man Top" and is the product of the Automatic Auto Top Co., 20 East Jackson boulevard, Chicago, Ill.

When lowered the top is wound on a drum in the rear of the body, the cache being covered by a tight fitting cap. To raise the top the driver simply operates a lever, which releases an auxiliary clutch and sets a train of gears in motion. A set of springs assist its initial motion.

As the front of the top appears the driver attaches its two cables to the sides of the windshield, while simultaneously the back supports are fastened by springs. The windshield cables draw the top forward when the driver throws in the top clutch, a shaft running the length of the car assisting in drawing it into its final position. This shaft and the roller in the top casing combine to fasten the cover in position.

The top has three spring steel braces, one on each side and one in the centre,



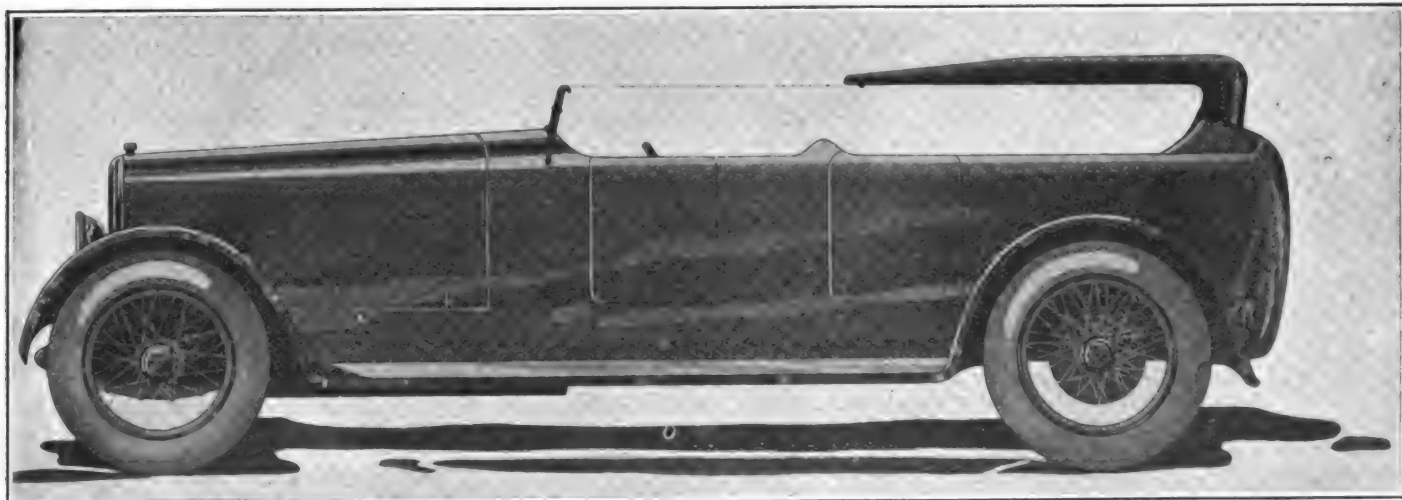
Rear of a Marmon Car Equipped with No-Man Top, Showing Cache at Rear in Which Top Disappears.

and in addition has an upright which can be raised from the centre of the body. In returning the top to its housing the action described is reversed.

AUTOMOBILE STAGES FOR YELLOWSTONE PARK.

Secretary of the Interior Lane has an-

nounced that 10-passenger motor cars will be used in Yellowstone National Park next summer to carry the sight-seers through the forest. The department had been considering for some time the advisability of substituting the motor 'buses for the picturesque horse drawn stages.



The No-Man Top Half Raised, the Dotted Line Indicating the Cables That Pull It Into Position.

COMING EVENTS

AUTOMOBILE SHOWS.

Philadelphia, Penn., Philadelphia Automobile Trade Assn.Jan. 12-20
 Cleveland, O., Cleveland Automobile Show Co.Jan. 13-20
 Detroit, Mich., Detroit Automobile Dealers' Assn.Jan. 20-27
 Montreal, Que., Can., Montreal Auto Trade Assn., Almy's Bldg.Jan. 20-27
 Rochester, N. Y., Rochester Auto Trades Assn., Exposition P'k.Jan. 22-27
 Buffalo, N. Y., Buffalo Automobile Dealers' Assn., at Broadway AuditoriumJan. 22-27
 Lowell, Mass., Lowell Auto Trade Assn., at Kasino.Jan. 22-27
 Scranton, Penn., at Armory.Jan. 22-27
 Manchester, N. H., at Academy Jan. 22-27
 Baltimore, Md., Automobile Club of Maryland and Baltimore Auto Dealers' Assn., Fifth Reg. Armory Jan. 23-27
 Oklahoma City, Okla., Oklahoma City Auto Dealers Assn., at AuditoriumJan. 23-27
 New Bedford, Mass., Coast Artillery Corps., at State Armory.Jan. 23-27
 Asheville, N. C., Asheville Auto Trade Assn.Jan. 25-27
 Chicago, Ill., National Automobile Chamber of Commerce, at Coliseum and First Reg. Armory.Jan. 27-Feb. 3
 Columbus, O., Columbus Dealers' Assn., at Memorial Hall Jan. 27-Feb. 3
 York, Penn., York Automobile Dealers' Assn.Jan. 27-Feb. 3
 Fall River, Mass., Fall River Dealers' Assn., at Casino.Jan. 29-Feb. 3
 Wilmington, Del., at Hotel Du Pont,Jan. 29-Feb. 3
 Minneapolis, Minn., Minneapolis Auto Trade Assn.Feb. 3-10
 Boston, Mass., American Road Builders' Assn., at Mechanics' Bldg. Feb. 5-9
 Bangor, Me., Bangor Automobile Assn.Feb. 5-10
 Hartford, Conn., Hartford Auto Dealers' Assn., at State Armory.Feb. 10-17
 San Francisco, Cal., Motor Car Dealers' Assn., at Exposition Auditorium.Feb. 10-18
 Toledo, O., Toledo Auto Shows Co., Terminal Bldg.Feb. 11-17
 Bay City, Mich., at Armory.Feb. 12-17
 Elmira, N. Y., Elmira Automobile Dealers' Assn.Feb. 12-17
 Indianapolis, Ind., Indianapolis Auto Dealers' Assn., Steinhart Bldg.Feb. 12-17
 Louisville, Ky., Louisville Auto Dealers' Assn., 1st Reg. Armory.Feb. 12-17
 Sioux City, Ia., Sioux City Auto Dealers' Assn., at Armory.Feb. 12-17
 Kansas City, Mo., Kansas City Motor Car Dealers' Assn.Feb. 12-17
 Watertown, N. Y.Feb. 14-17
 Peoria, Ill., Automobile and Accessory Dealers' Assn., at Coliseum.Feb. 14-17
 Racine, Wis., Racine Auto Show Assn.Feb. 15-17
 Newark, N. J., Newark Auto Dealers'

Assn., at 1st Reg. Armory.Feb. 17-24
 St. Louis, Mo., Auto Mfrs. and Dealers' Assn.Feb. 18-24
 Syracuse, N. Y., Syracuse Auto Dealers' Assn., at State Armory.Feb. 19-24
 Grand Rapids, Mich., Automobile Business Assn., at Klingman Bldg.Feb. 19-24
 Des Moines, Ia., Des Moines Auto Dealers' Assn., at Coliseum.Feb. 19-24
 Duluth, Minn., Duluth Auto Dealers' Assn., at New Armory.Feb. 19-24
 St. Louis, Mo., St. Louis Auto Dealers' Assn., at Overland Bldg.Feb. 19-24
 Bridgeport, Conn., Coast Artillery Corps., at Armory.Feb. 19-24
 Pittsfield, Mass., J. J. Callahan, Mgr., at Armory.Feb. 19-24
 South Bethlehem, Penn., at Coliseum.Feb. 19-24
 Brooklyn, N. Y., Brooklyn Auto Dealers' Assn., 23d Regiment ArmoryFeb. 24-March 3
 Omaha, Neb., Omaha Auto Show Assn., at Auditorium.Feb. 26-March 3
 Wilkes-Barre, Penn., Auto Dealers' Assn.Feb. 26-March 3
 Atlanta, Ga., Atlanta Auto Trades and Accessory Assn., at AuditoriumFeb. 27-March 4
 St. Joseph, Mo., Auto Dealers' Assn., at Auditorium.Feb. 28-March 3
 Urbana, Ill., Automobile Trade Assn., at Armory.March 1-3
 Boston, Mass., Boston Auto Dealers' Assn. and Boston Commercial Motor Vehicle Assn., at Mechanics' Bldg., Chester I. Campbell, Mgr.March 3-10
 Fargo, N. D., Gate City Auto Show Co., at Auditorium.March 6-9
 Ft. Dodge, Ia., G. W. Tremain, Mgr., at New Terminal Warehouse.March 6-10
 Trenton, N. J., Trenton Auto Trade Assn., at 2d Reg. Armory.March 14-17
 Davenport, Ia., Tri-City Auto Trade Assn., at Coliseum.March 14-17
 New Haven, Conn., New Haven Auto Dealers' Assn., Hotel Taft.March 19-24
 Cedar Rapids, Ia., Automobile Trades Assn.March 19-24
 Calumet, Mich., Frank Ketchell, Mgr., at Coliseum.April ..

AUTOMOBILE RACES.

Los Angeles to Salt Lake City, Road.April ..
 New York, Sheepshead Bay, Speedway, Metropolitan.May 19
 Indianapolis, Ind., Championship, Speedway.May 30
 Chicago, Ill., Championship, Speedway.June 9
 Cincinnati, O., Speedway.June 23
 Omaha, Neb., Championship, Speedway.July 4
 Des Moines, Ia., Championship, Speedway.July 14
 Tacoma, Wash., Championship, Speedway.July 28
 Kansas City, Mo., Speedway.Aug. 4

Cincinnati, O., Championship, Speedway.Sept. 3
 Providence, R. I., Championship, Speedway.Sept. 15
 New York, Sheepshead Bay Speedway, Championship.Sept. 29
 Kansas City, Mo., Speedway.Oct. 6
 Chicago, Ill., Speedway.Oct. 13
 New York, Sheepshead Bay Speedway.Oct. 27

CONVENTIONS, ETC.

Society of Automobile Engineers, Mid-Winter Meeting, at Engineers' Bldg., New York City.Jan. 9-11
 Motor and Accessory Mfrs., Banquet, at Waldorf-Astoria, New York CityJan. 10
 National Assn. of Auto. Accessory Jobbers, 2d Annual Convention, at Congress Hotel, Chicago, Ill.Jan. 24-26
 American Road Builders' Assn., 8th Annual Convention, at Mechanics' Bldg., Boston, Mass.Feb. 5-9
 American Assn. of Garage Owners, Convention, at Auditorium Hotel, Chicago, Ill.Feb. 1-2

OMAHA AUTOMOBILE CLUB HAD VERY ACTIVE YEAR.

The Automobile Club of Omaha, Neb., engaged in many activities during the present year in interest of the members and motoring public in general. Hundreds of tourists passing through the city were entertained at the club rooms and an active interest was taken in bettering all the main highways leading through the state. The George Washington National Highway, a diagonal route, leading from Seattle, Wash., to Savannah, Ga., was organized by the club and P. A. Wells, counsel of the organization, was elected president of the highway.

Over 2000 road signs were erected in nine counties of Nebraska and Iowa and over 900 poles were painted within the city of Omaha to designate the route of the Lincoln Highway, George Washington National Highway and the Omaha-Kansas route.

The membership was increased during the year from 700 to 1060 and a campaign for a membership of 2000 will be conducted during the next year.

The following officers have been elected for the ensuing year: G. L. Gould, president; Randall K. Brown, first vice president; W. B. Cheek, second vice president; Col. B. W. Jewell, treasurer; L. V. Nicholas, secretary; P. A. Wells, counsel.

REPORTS OF EXPERIMENTS IN ROAD PRESERVATION.

The United States Department of Agriculture, Office of Public Roads and Rural Engineering, has issued a bulletin on "Progress Reports of Experiments in Dust Prevention and Road Preservation, 1915. Copies of the bulletins may be obtained from the superintendent of documents, Government Printing Office, Washington, D. C., at 10 cents per copy.



Accessories and Equipment



GRACE PNEUMATIC CONTROLLER.

A device which functionizes as a gasoline economizer, decarbonizer, primer, air brake and carburetor controller has been placed on the market under the name of the "Grace Pneumatic Controller."

The device has no moving parts, consisting of a small flexible tube leading from the steering post or dash to an enlarged pipe section placed on the manifold or the hottest part of the engine. From the opposite end of this larger section another piece of tubing is connected with and enters the manifold just above the carburetor. The warm flow of air sucked through the tube assists carburetion, or the tube may be used as a means of introducing a priming charge to the motor, the fuel being gasified after passing through the hot drum. Decarbonizing liquid may be introduced in the same way and when the engine is shut off on a down grade the air valve may be opened wide and the cool air admitted to the combustion chambers. It also serves as a brake and prevents the lubricating oil from being drawn up past the piston rings.

Made by Grace & Co., 3205 West Washington street, Los Angeles, Cal. Retail price, \$10.

THERMO ELECTRIC PRIMER.

The Thermo electric gas primer is a device that screws into the inlet manifold and delivers heated gasoline vapor and boiling hot liquid gasoline to all cylinders to facilitate starting action even on the coldest day.

It is formed of a brass chamber, around which is wound a heating unit connected through a switch to the battery wire. When the electric connection is made the chamber becomes heated to a temperature of 300 to 500 degrees in about a minute. When the starter pedal is depressed a needle valve is opened and the vacuum in manifold sucks gasoline into the chamber independent of the carburetor action. This charge being highly heated, it gives off a highly explosive gas. The action is automatic when the switch is turned on and the needle valve rod is turned, and it does not require any hand pumping or filling. The tubing and wire for making the connections are furnished with the primer.

Made by New York Coil Co., 338-340 Pearl St., New York, N. Y. Retail price, \$5.



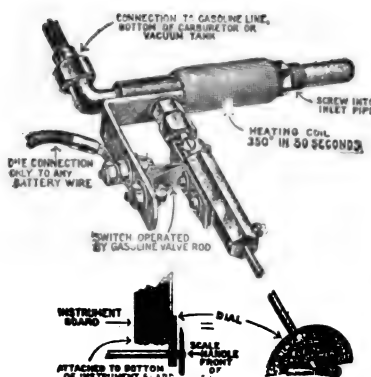
Grace Gasoline Economizer.



Jiffy Jax.



I-H Half Sole Tire.



Thermo Electric Primer.

JIFFY-JAX TIRE SAVERS.

To save the tires from the rotting effect of oil and water and grease which accumulates on a garage floor, it is necessary to jack the car up if they are to stand for any length of time, and for that purpose these Jiffy Jax tire savers have been brought out. They are made of steel and consist of a sliding lifter, which is operated through an offset handle of generous length by a toggle link arrangement. The leverage is such that only a slight effort is required to exert a lifting effort of 1000 pounds, and the jacks stay in the lifted position without further attention. They are adjustable for most any size wheel with a range from 13½ inches to 18½ inches. They are furnished four to a set, one for each wheel. The steel saddle is fitted with a solid leather cushion so as not to mar the finish at the point of contact. Capacity of one jack is given at one ton.

Made by the Jiffy Jax Company, Cleveland, O. Price, \$6.00 set.

"I-H" RUBBER HALF-SOLES.

A new non-skid model of the "Half-Sole" tire is being placed on the market. It is similar to the smooth tread design with three to five plies of extra strong tire fabric solidly vulcanized together under several thousand pounds pressure. The cushion, which is in the centre of the tread next to the fabric carcass, is a thick ply of very elastic rubber, which serves to attach the rubber tread firmly to the carcass. The conventional breaker strip forms the next layer and supports the tread, which consists of nearly a half inch of unusually tough rubber moulded into a "I-H" design. These Half-Soles are made to go over any tire, old or new, and the maker claims that their use will double or treble the mileage. They carry a guarantee against puncture.

Made by the International Rubber Co., Denver, Col. Write for prices.

NEW CRONE PRIMER.

The new Crone Primer is designed to facilitate the starting of the engine and save the starter batteries. It sprays a fine cloud of combustible gasoline at a point where the first spark starts the engine, only one or two operations of the primer starter being necessary. When not in use the valve is seated tightly and

locked in position by turning the handle either to the right or left. Attachment is by boring a $\frac{1}{4}$ inch hole through the instrument board and fastening by a lock nut, and tapping manifold for a $\frac{1}{8}$ inch gas pipe tap. The plunger is the full size of the barrel, which obviates the use of washers. The primer has no parts to wear out. Full details of the operation and construction of the device can be obtained from the manufacturer.

Manufactured by F. G. Crone, 334 Genesee street, Buffalo, N. Y. Retail price with fittings, \$5 for one type and \$6 for another.

MINUTE DEMOUNTABLE WHEEL.

The Minute Demountable Wheel is, as its name implies, designed to afford instant change of Ford wheels on the road when tire troubles develop, obviating the necessity of struggling with the tire. The wheel is taken off by simply unscrewing one nut, and it can be replaced just as easily, the maker claiming either operation can be done in 60 seconds. The Minute Wheel equipment requires that the four special hubs sold with the wheel be fitted upon the regular Ford hubs, which gives increased strength to the assembly. The Ford wheels are used and the flange part of the new hubs is bolted to this with its powerful driving lug bolts. The two units lock together with the exactness and more than the strength of one piece. As the nut goes on with a left hand thread, it is impossible for it to come off, even though the locking plate, which is provided, should not be used.

Made by the Hill-Smith Metal Goods Co., 88 Pearl St., Boston, Mass. Retail price for complete equipment for four wheels, \$30.

IGNITION LOCK FOR FORDS.

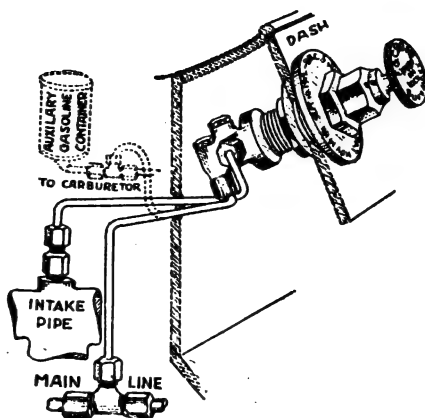
The New York ignition switch lock for Ford cars is a non-pickable barrel lock built into a steel nicked housing and of very compact construction. It is easily installed by removing the three screws which hold the name plate on the regular Ford switch and screwing the ignition lock in place. Less than five minutes are required to install it.

A three-lobed cam inside the switch forces outward three sliding members, which conceal and protect the retaining screws. They remain over the screws after the first operation of the switch and do not slide each time the key is turned. The key can only be removed when the switch is on the "off" position, when the cam prevents the lugs from being forced inwards.

Made by the New York Coil Co., 338 Pearl St., New York, N. Y. Retail price, \$3.

HARTFORD BUMP ABSORBER.

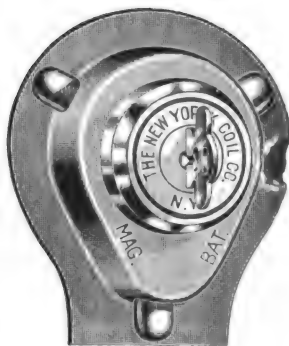
In describing the Hartford Bump Absorber the maker states "It is more than a mere bumper; it is bump and shock



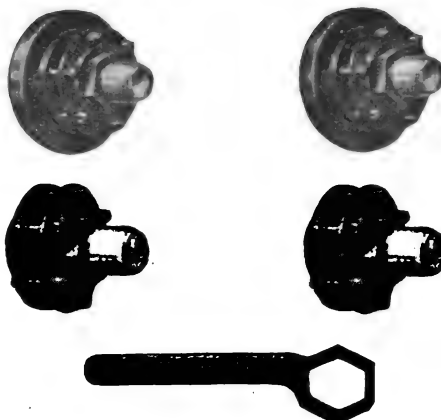
New Crone Primer.



Hartford Bump Absorber.



Ignition Lock for Fords.



Minute Demountable Wheel, Showing Special Hubs and Wrench.

absorbing." A bumper is shown in the accompanying illustration mounted on the front of a car. It consists of two powerful and unbreakable loops of spring steel bolted onto the frame, it fitting any size and type of vehicle. The loops are resilient and give before the blow instead of being rigid, and they extend beyond the wheels on both sides, affording protection to those members. It is not necessary to bore or drill holes to install the bumper.

Made by the Edward V. Hartford, Inc., formerly the Hartford Suspension Co., 147 Morgan St., Jersey City, N. J. Write for prices.

LETTS MANIFOLD HEATER.

This device is intended to counteract the poor qualities of low grade fuel and to increase the mileage obtainable from it. In fact, it is guaranteed to afford an increase of from 20 to 40 per cent. per gallon. It differs from other types in that it is a two-unit type, instead of being cast integral with the manifold intake upon which it acts. It takes its heat from the exhaust and breaks up the globules of gasoline into a thorough vapor, making for instant combustion and minimum carbonization. A feature of the device is that it is in two parts, which makes it easy to attach or detach and gives the owner opportunity to clean it out at necessary periods without difficulty. The cleaning feature is valuable, because, due to the nature of manifold heater castings, carbon collects on the walls and interferes with carburetion. The maker advises that the device is equally serviceable in warm or hot climates, where considerable trouble frequently arises through the water in the radiator boiling. The Letts device maintains regular and quick firing and in that way insures a comparative and desirable coolness in the power plant.

Made by the Hill-Smith Metal Goods Co., 88 Pearl street, Boston, Mass. Retail price, \$6.

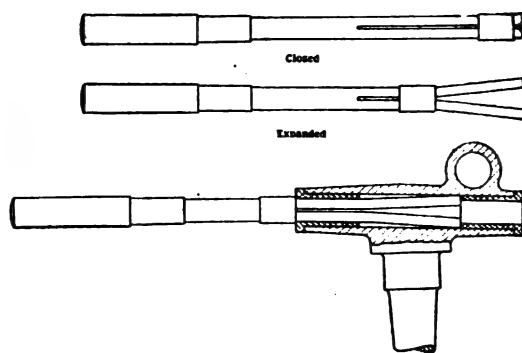
HARTFORD SHOCK ABSORBER.

One of the features of the Hartford exhibit at the New York show was the demonstrations of the Hartford shock absorbers to prove that they absorb all road shocks, prevent side sway, vibra-





Letts Manifold Heater, Showing It Open for Cleaning.



Jiffy Bushing Extractor, the Top Views Showing It Open and Expanded and at Bottom the Tool in Use.

tion and jolting, eliminate the possibility of spring breakage and insure longer life for the car and its equipment, not to mention the increased comfort to passengers. These absorbers, which are made in six sizes, from the kind for the lightest of cars to the heaviest, are of the well known racing type that has been standard equipment on all speedway racing cars during the past season. Each Hartford set, consisting of four absorbers, is complete and ready to attach when received, and they are accompanied by detailed instructions for the work of installation. They are sold under the standard Hartford guarantee, which reads: "Money back if not satisfactory."

Made by the Edward V. Hartford, Inc., formerly the Hartford Suspension Co., 147 Morgan street, Jersey City, N. J. Write for prices.

JIFFY BUSHING EXTRACTOR.

The Jiffy Bushing Extractor for Ford cars is designed to facilitate the removal of bushings from Ford steering knuckles, steering spindle arms or spring bushings, and makes valuable equipment for the owner who works on his car himself or for garage and professional repair men. As shown in accompanying sketch the tool has two spring legs, which when introducing the tool into the bushing are held together by a collar. As the extractor enters deeper into the bushing the collar is held back by the outer end of the bushing and the legs spring apart until they are at full width and seated against the inner end of the bushing. Then a few sharp blows with a mallet will drive the bushing out. The work is done so quickly and easily the maker has named the tool the "Jiffy" to indicate the speed of operation. With this tool it is not necessary to remove a wheel when extracting steering knuckle bushings.

Made by the G. H. Dyer Co., 155 Brookline St., Cambridge, Mass. Retail price, \$1.25 each.

MASTER CALORITE PLUGS.

In the 1917 models of the Master Calorite Spark Plugs, the already heavy calorite insulator has been greatly increased in size to increase their strength and prevent breakage from side blows



Master Calorite Spark Plug.

resulting from sharp contact with wrenches or other tools being used around the engine.

Calorite insulators will withstand enormous strains resulting from sudden temperature changes and are tested by being heated white hot in a gasoline blow torch and then plunged into cold water. This is a far more severe test than the plugs are subjected to in actual use, but it can be repeated many times on calorite plugs without causing any sign of a fracture.

Made by Hartford Machine Screw Co., Hartford, Conn. Prices sent on application.

LAZCO SPRING LUBRICATOR.

The value of good spring lubrication is acknowledged by all manufacturers and experienced users of motor cars. Constant lubrication between the leaves of the springs eliminates the friction, prevents rust and lessens the tendency of the springs to crystallize.

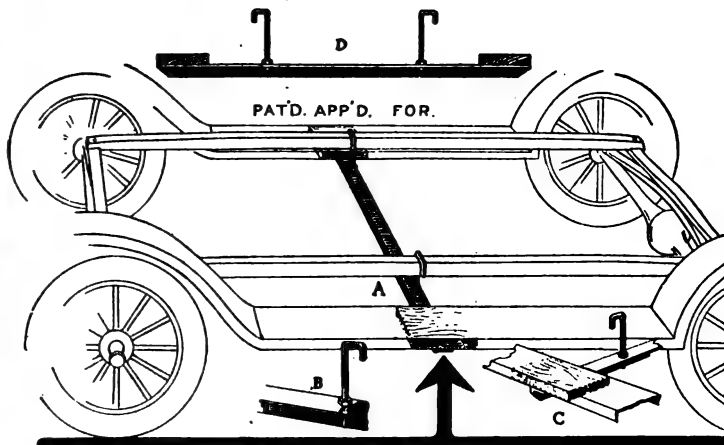
The Lazco adjustable spring lubricator is a device which clamps on to the central section of the spring member. It contains a reservoir for the lubricant and felt pad through which the lubricant is fed automatically between the springs. It is adjustable both as to the height of the spring and width, fitting all spring sizes from the Ford to those used on the largest trucks.

Made by the Lazarus Mfg. Co., 750 Prospect Ave., Cleveland, O. Retail price, 50 cents each.

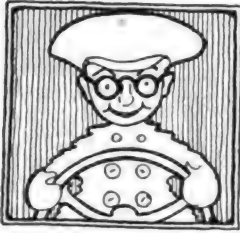
DOW BODY BRACE FOR FORDS.

The Dow Body brace for Ford cars is designed to stiffen the body and give rigid support to the running boards, preventing the latter from giving and working loose from constant use. It is made of a strong steel angle brace, which is secured to the frame midway between the axles with board sections at the ends, which fit in the channels of the running boards. The weight complete is 12 pounds.

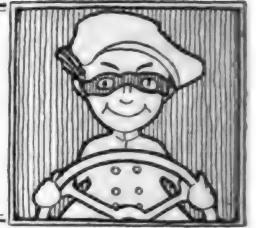
Made by the Dow Wire and Iron Works, Louisville, Ky. Retail price, \$2.50.



Dow Body Brace for Ford Cars.



Graphic Items



A department store in Connecticut has just added a line of automobiles to its varied assortment of merchandise. Since the announcement was made in the local



newspapers the feminine patrons have been eagerly watching for a special sale on "joy wagons." To avoid the usual loss resulting from the desire by feminine purchasers to exchange about 75 per cent. of their purchases for something different, the store management is said to be thinking of measuring each buyer to see if he fits the machine.

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The automobile made its debut as an officially recognized institution in England 20 years ago, when a line of cars passed in review along Brighton Road to show the authorities that there was nothing dangerous about them and that they could be controlled. This method was adopted to convince the government that there was no longer any need of compelling the operator of a vehicle propelled by other power than horses, to send a man ahead of the machine with a red flag to warn of its approach. If this queer looking line of horseless carriages, as they were called in that day, could be placed beside an equal number of the 1917 models, the contrast would be amazing.

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Strange as it may seem, a man has come forward to testify to the prodigal liberality of the motorist, although his testimony has not received any substantiation as yet from garage men or gasoline dispensers. This man is a door man at a well known hotel in a large Massachusetts city. Through a study of courtesy and amiable smiles he has extracted no less than \$1000 from the pockets of motorists in the form of tips during the past four months. Since he took the job two years ago he has



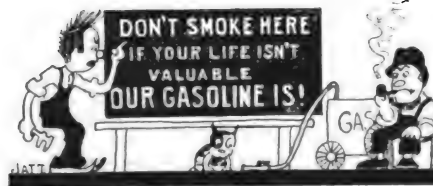
bought a piece of land, built a home, taken a wife and has a neat pyramid of coin at the town savings institution.

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A Baltimore real estate operator who specializes in selling homes has devised the inducement extraordinary for his customer and one which is about as near irresistible as could be imagined. With each home that he sells, including a garage, he throws in a perfectly good automobile, so when the new owner moves in he simply takes the key to the garage, unlocks the door and drives out his new machine and is all established in the community on the same plane with the other owners of automobiles.

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Easterners visiting in New Mexico all agree that the natives of that state can express themselves in a manner that admits of no misunderstanding. One such visitor reports he saw the following sign in a garage and instantly knew the meaning it was intended to convey:



"Don't Smoke Here. If Your Life Isn't Valuable, Our Gasoline Is."

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The unexpected, which so often happens, took place when a light touring car ran into a heavily laden truck in Bridgeport, Conn. The occupants of the pleasure vehicle anticipated that their machine would immediately be folded up like an accordion and that their limbs and bodies would be somewhere in the creases. Much to their surprise, however, when the crash came the big truck with its heavy load toppled over on its side. The driver of the truck and the occupants of the pleasure machine were more or less mussed up, but the injuries were not serious, except those sustained by their dispositions during the few minutes in which there was a lively volley of charges and counter-charges regarding the carelessness of certain persons.

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Like the automat restaurants, the self-service garage has sprung up and is said to have filled a long felt want. The motorist wishing to repair his own machine drives to the garage and puts his car in one of the private stalls that are provided. All the necessary tools and ma-

chinery are available for his use and when he has completed the work he returns the tools to the office and pays his bill, which includes charges for the



time the stall was occupied, use of tools and wages of assistant if one is required.

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A motorist of Williamstown, Mass., has presented the town of Pittsfield, Mass., with a bill of \$114.50, which represents the cost of repairing the damage done to his automobile by a deer which leaped from the roadside onto the engine hood. The deer was killed by the act and its carcass was turned over to a game keeper.

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Although it is admitted that the automobile performs the same service as a driving horse, the Supreme Court of Tennessee has ruled that in case of a legal claim a motor car is not exempt from execution under a code exempting horses, mules and wagons.

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As a double precautionary measure to protect his mules a Western breeder has equipped them with tail lights, which are fastened around the animals' tails. This serves to warn motorists in case the mules stray onto the highways and also serves to enable pedestrians to select a soft spot on which to land if they should get too close to the lamps. Before adopting this expedient the breeder had suffered the loss of a number of mules that were killed by motor cars.

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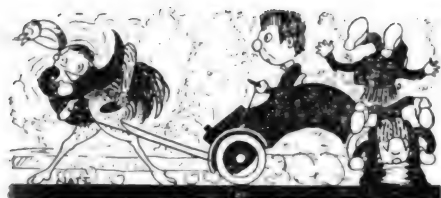
The comfortably seated passenger speeding along in the Pullman coach on the Lehigh Valley road can no longer gaze through the window with derision at the section hands pumping their way along on a parallel track seated astride



of a hand car. In keeping with modern efficiency ideas, this method of transporting the section hands is considered a waste of manual energy that otherwise might be directed toward driving the spikes a little deeper and tamping in the road bed, and so gasoline engines are being installed on the hand cars, and Pasaquale, Tony and Garibaldi hereafter, in going and coming from work, can take in the landscape while the engines do the work.

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A big, trained, Nubian ostrich was used in making a unique demonstration of an Inter-State car in California. The



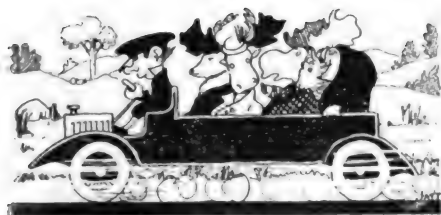
big bird, with a trainer on its back, was hitched to the car by traces and found no difficulty in pulling it along with its three passengers.

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The distributor of Chandler cars in Southern California has transformed one of his cars into a camping van, built on prairie schooner lines. The body has many features providing for the comfort and convenience of the campers. The front seats fold out over the running board, making room for a mattress, which rolls down from the rear of the tonneau, providing a comfortable bed. A small gasoline stove is carried on the running board. The tire rack serves in the dual capacity of larder and table, the lid forming a table when dropped.

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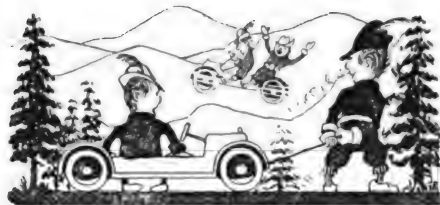
There would be nothing novel in the fact that wild animals had taken to joy riding, but this story deals with a less dangerous type of fauna, including buffalo, deer and elk. These animals, which were formerly corralled in the city park at Denver, were given a 25-mile motor car ride to Genesee Park,



which is located on the other side of Lookout Mountain, in the mountain park system of the foot hills. The animals were given a good example in road ethics, the truck that transported them being driven slowly up the steep grades and also an opportunity to take in the scenery.

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In the Swiss mountain resorts when there is no snow for tobogganing, vehicles resembling light automobiles, but without engines, are used as a substitute



in coasting swiftly down the long, steep slides.

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Alfred Gill of Los Angeles, Cal., has taken up a Gypsy life, but instead of gaining his livelihood as do the professional nomads, by breeding and trading in horse flesh, he derives his income from automobilists by rendering service and selling supplies. His road van is of a very different type from that forming the nucleus of a Gypsy caravan, being made up of a miniature garage repair shop fitted to a Chevrolet "four-ninety" chassis. His shop is a common sight on the highways about Los Angeles and many motorists have found occasion to patronize him.

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The recent big snow fall gave the amateur snow sculptors their first opportunity to erect snow men and other structures of the glistening flakes, and although many months had elapsed since the last storm the juvenile designers seemed to have developed their talent.



In one section in Rhode Island a crowd of youngsters built a replica of a touring car and formed it with such detail and excellent lines that it attracted widespread attention in the neighborhood.

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During the past year 729 persons were killed on the streets and highways of New York state by automobiles, as compared with 663 during 1915. In New York City alone 392 persons met their deaths by automobiles during the year, while trolley cars killed 78 and wagons 74.

In the State of New Jersey automobiles killed 215, trolleys 14 and wagons 18, as compared with 241, 29 and 12 respectively in 1915.

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In a small southern New England town where it is the annual custom for Santa Claus to visit the poorer children of the community on the "night before," he appeared this year in a touring car



decorated with mistletoe, tinsel and ribbons, and brought his Christmas tree with him so that each of the little tots could select their own choice of the presents that weighted down the boughs.

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A new ice sport was developed on a New England pond recently when a youth drove out on the frozen surface as an experiment. A long line of skaters immediately formed on the end of the machine to be towed. When the driver of the car suddenly shut off his engine, turned his front wheels sharply to one side and applied the brakes, it had the same effect upon the long line of skaters



as when the leader in the game of snap-the-whip suddenly sets himself.

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Every seventh family in the United States owns an automobile according to the compilation of registration statistics made by the American Automobile Association. These figures were as of July 1, 1916, when a total of 2,923,454 cars were registered in the country. In the past six months it is estimated that fully 300,000 cars have been made and sold.

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For the purpose of lessening the consumption of gasoline in India, the government has issued a notice prohibiting the imports of automobiles into that country. A total of 2634 American cars, valued at \$456,666, were imported in India from April to November, 1916.

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An enterprising individual has reproduced the automobile in miniature, true to detail for the use of juveniles. The car is fully equipped and has an engine of less power than is used on the motorcycles to lessen the danger to the



younger motorists and to thwart their desires to emulate their elders in becoming speedmongers.

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Automobile associations in Massachusetts have sent out warnings that auto thieves have become unusually active in that state. Many cars have been stolen and numerous cases have been reported where sneak thieves have stolen packages, robes and other things from cars standing by the curb in large cities.



A MOVEMENT for a change in the system of traffic regulation is being agitated strongly again throughout the country and most of the experts favor the adoption of the Eno rotary system at the street intersections where the space affords sufficient room for its operation.

Traffic conditions on Fifth avenue, New York, steadily increase in volume and have evidently gone beyond the scope of the present block system so far as proper regulation is concerned. A trial was given the Eno system at 57th street and Fifth avenue, but Police Commissioner Woods declared it to be unsuccessful.

If the trial did not prove that the system was more advantageous than the block system, it is claimed by the men who were instrumental in having the trial made, that was because the traffic in that section was fed by the block system at the first crossing north and the first crossing south.

The rotary system was given a trial in Detroit last February at the convergence of five streets, where formerly five policemen were necessary to regulate the traffic under the old block system. This trial was so successful the Eno system was adopted and only one policeman was required to supervise traffic at the corner. Police reports also showed that there had been a material decrease in the number of traffic accidents at that point.

The only difficulty the officials of that city anticipated was the possibility that pedestrians could not make their way safely across the thoroughfares through the encircling stream of traffic. It proved, however, that fear on this score was unfounded, as there were frequent breaks in the circle of vehicles that permitted ample time for the people to get from one sidewalk

to the other. In fact, crossing was facilitated by the zone of safety that was created in the centre of the circle.

The Eno system, which has been previously described in this magazine, was first introduced in this country by William Phelps Eno, who has been styled the "Father of Street Traffic Regulation." He and Samuel Walter Taylor have worked continuously on traffic problems for over 16 years and are looked upon as authorities on the subject. The latter believes that the Eno system can be worked successfully in New York, at 42nd and 34th streets, and at other intersections of Fifth avenue.

The system involves a principle, as shown in the accompanying illustrations, by which the crossing of the direct line of travel of a vehicle by another vehicle is avoided. In the block system it was necessary to check the flow of traffic from one direction at intervals while the intersecting traffic passed. The rotary system does not require any cessation in traffic, as it is made to flow together at the intersection regardless of the direction in which it is headed.

Except for the few additional feet that a vehicle may be obliged to travel to negotiate the crossing, there is no loss of time in the Eno system, while in the block system the loss of time is consid-

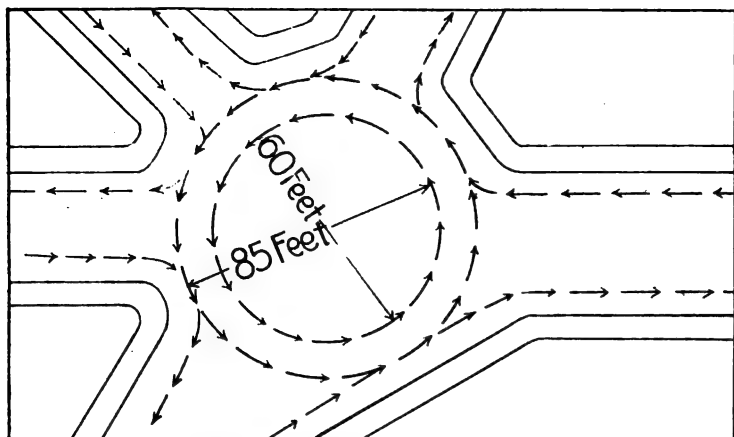
erable in traversing any of the long thoroughfares in a large city. The confusion is greatly increased as the drivers of the autos and carriages in the rear of the rapidly moving line that is brought to a stop have to draw up suddenly, receiving no warning that the traffic has been held up at the cross walk, except that given by the slowing up of the vehicle next in front of them in the line. On the other hand, the advocates of the Eno system claim that there is less confusion resulting from that method, as the traffic movement is continuous and that nearly double the volume of traffic can pass over a given stretch of highway than by the block system.

Now that the movement for uniform traffic regulation has attracted country-wide interest and support, the question of selecting the most efficient method of handling the traffic at intersections of streets in congested districts is becoming more important than ever. In addition to Detroit, New Haven, Conn., and Memphis, Tenn., several other large cities have adopted and have been using for some time a system at these crossings similar, if not identical, with the Eno system, and the officials of those cities have high praise for it.

The only argument that seems to stand against the system which is applicable to instances where the space at the intersections of streets is sufficient to carry out the principle properly, is that of danger to pedestrians crossing through the traffic. Under the block system, it is true that while the policemen held back the flow of traffic from one direction people had an opportunity of crossing the street without any danger. Despite this fact accidents continued and statistics proved that in both New York City and German cities over 85 per cent. of all the traffic accidents that ended in seri-



An Example of Traffic Problems in Large Cities; This View Shows a Busy Corner in Providence, R. I., and Seven Motor Vehicles Going in as Many Directions.



Diagrammatic Illustration of the Eno System.

ous injuries or fatalities, the fault has been with the injured. This showing is believed to indicate that in the case of choice between the Eno and block system, the question of preventing or avoiding accidents to pedes-

trians should not be taken as an argument either for or against either, as assuming that all drivers were perfect and accident proof, the number of accidents would be decreased less than 15 per cent.

It would seem that the burden of cau-

tion lay largely with the pedestrian and this fact is being recognized by authorities in many cities who realize that the time has come to devote a little attention to educating people up to the realization that they must be attentive.

A.A.A. Tests Wilmo Manifold

In a Recent Demonstration Preheating Device Betters Maker's Claims for It.

NOW that the tendency among motorists is to keep their cars in operation throughout the winter months, they find it necessary to equip their machines with devices that will preheat the gasoline charge before it enters the combustion chamber. The purpose of this is to increase the efficiency of the engine by increasing the combustibility of the gasoline.

Several ways of doing this have been devised, but one of the best devices on the market and one that recently withstood gruelling tests by the American Automobile Association, is called the Wilmo Manifold, which is the product of the Gillette Motors Co., Mishawaka, Ind. This device is compact and simple in

construction and application, and the maker claims it will increase the mileage per gallon from 20 to 40 per cent.

A test was held on Dec. 4, 1916, under the auspices of the A. A. A. at Mishawaka, Ind., a standard Ford touring car being used with standard factory equipment and three passengers were carried. The car, which had covered more than 20,000 miles, was first driven at the rate of 20 miles an hour equipped with its standard manifold. The gasoline consumption averaged 19.6 miles to the gallon.

The car was then equipped with a Wilmo combination manifold, and driven at the same rate of speed. The car traveled 28 miles on one gallon of gasoline,

an increase of 42 per cent. A second test was then made, using a fuel mixture of half kerosene and half gasoline, and 28.6 miles was covered on one gallon, or an increase of 35.6 per cent.

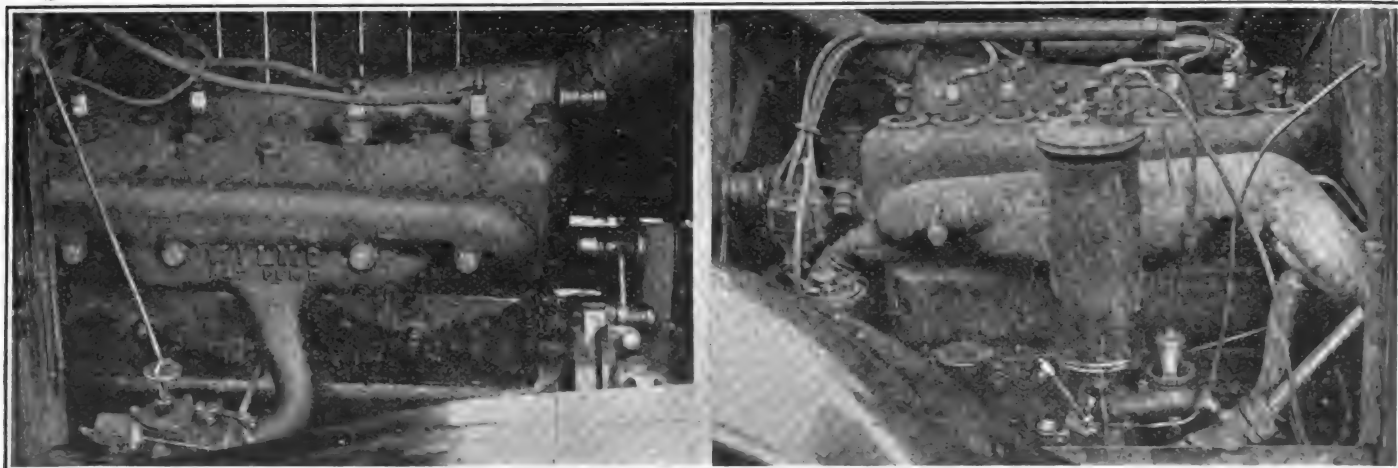
Still another test was made by the Wilmo Manifold on a Studebaker Six with top and windshield up and carrying three passengers, making a total weight of 3570 pounds. Using a standard Studebaker intake and exhaust manifold equipment and straight commercial gasoline, an average of 10.6 miles was obtained to the gallon of fuel. The Wilmo combination manifold was installed on the same car and with the same load and using the same fuel, an average of 16.4 miles to the gallon was obtained, an increase of 54.7 per cent.

The Wilmo Manifold is a one-piece gray iron casting with an iron division plate cast integral, separating the upper or exhaust chamber from the lower or intake chamber, the latter connecting with the carburetor by a tapered inlet pipe. The hot exhaust gases passing out over the division plate heat it to a very high temperature and as the charge from the carburetor hits the under side of the plate before spreading out to the intake valves, it becomes completely vaporized. There are many efficient results from delivering a completely vaporized charge to the motor, among which are more power, a smoother running engine, little carbon accumulation, more flexibility of power and better lubrication.

THE WALLACE C. HOOD SERVICE BUREAU.

The Wallace C. Hood Service Bureau, Dime Bank building, Detroit, Mich., has issued a large booklet describing the activities of the concern and the part it plays in furnishing service to both the manufacturing and distributing branches of the motor car industry.

Large individual portraits of Mr. Hood and the men who head the different departments of the bureau are printed in the book, with brief historical sketches of their past business experience that has qualified them to take up their respective duties.



Wilmo Manifold Used in the A. A. A. Tests, the View at the Left Being the Installation of the Model T Ford and at the Right the Studebaker Four.



WRENCH PIPE CUTTER.

(Figure 289.)

A pipe cutter is a valuable tool to have handy, and one can easily be made at home, as illustrated in the sketch. This shows an ordinary monkey wrench with cutting discs attached. The discs, which are of steel, are easily obtainable at any hardware store and cost only a few cents. To attach, bore a small hole through each jaw of the wrench, attach the discs by means of stove bolts and tighten securely. A little space should be left for the discs to turn in. The jaws being adjustable this device can be used to cut different sizes of pipe.

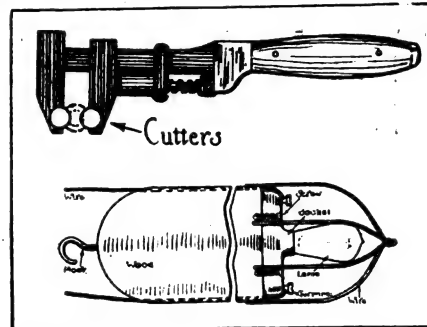


Fig. 289—Wrench Pipe Cutter and Electric Bulb Cage.

REPAIRING GASOLINE LINE.

(Figure 291.)

If a break should develop in the gasoline line while on the road, try the following method of temporary repair. If the break is in the middle of the pipe and you have a section of rubber tubing handy, slip it over the sections and place thin strips of wood lengthwise of the pipe and bind securely with friction tape. The splints will prevent chafing of the rubber tube, and the whole contrivance will conserve the gasoline supply and enable you to reach a repair shop or your home. If the rubber tubing is not at hand, bind the pipe first with tape, then attach the splints and bind together with another layer of tape. If a small crack in the pipe has developed it can be sealed temporarily by plugging with soap and covering with tape. Soap is a very handy article to have in the repair kit at all times, as there are a number of purposes for which it can be used.

STEERING WHEEL WINDSHIELD.

(Figure 293.)

A reader describes how the stock windshield on his roadster was utterly demolished in an accident, and how he contrived one like that shown in sketch. The shield was made from a piece of celluloid he had handy, it being cut to the shape shown and fitted with a light metal frame and bound with leather. The shield was made about 18 inches across its widest portion, and the frame of thin, flat iron and the whole was attached to the steering wheel and made adjustable. Of course glass could be used in place of celluloid and the shield could be attached to the steering column.

A READER'S SUGGESTION.

(Figure 290.)

A Delaware reader relates how he used a small block of wood and a hub cap to remove a rear wheel on his car in an emergency. The sketch illustrates the idea he advances. He cut a small block of wood to proper size and inserted in the cap, and partially screwed on the cap, until the wheel gave under the pressure. In considering this method it is essential to remember that it is not recommended when the cap is made of light metal, nor should undue strain be brought to bear. If the wheel does not move readily it can be started by giving the cap a few sharp blows with a hammer.

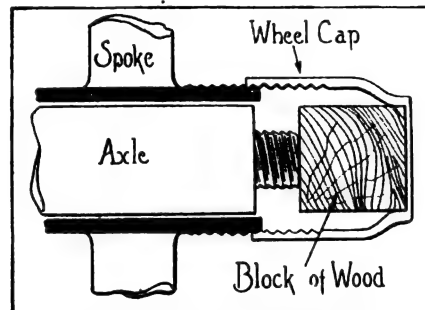


Fig. 290—Wheel Remover.

PROTECTING ELECTRIC BULBS.

(Figure 289.)

When using an electric bulb around an engine for illumination you should guard against accidental breakage. Our sketch shows a home made contrivance that has been proven practical. The socket of the lamp is screwed into a block of wood about three inches long and having two grooves along its opposite sides in which to carry the feed wires. A cage can be made, as indicated, out of several strands of fairly heavy wire, the loose ends being sunk into recesses in the block and secured by a binding of friction tape. A hook can be attached to the block by which to hang up the device when desired. When a bulb has to be replaced it can be done easily by springing apart two of the cage wires.

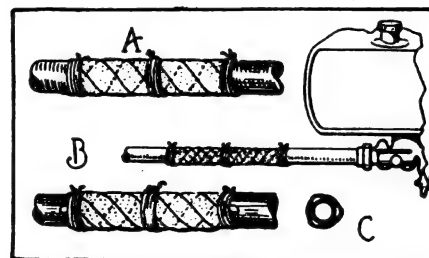


Fig. 291—Gasoline Line Repair.

DRILL AND REAMER HOLDER.

(Figure 292.)

An easily made drill socket designed for holding straight shank and broken drills, reamers and similar tools, is shown in our sketch. Adapters can be used to permit the use of drills of various sizes. The adapters can be turned from a piece of cast steel and may be made with a tapered shank on a square section member, the latter being suitable for use with a ratchet brace.

The holder has a recess bored in it, as indicated by dotted lines in sketch, either for fitting the shank of a drill or to take various split adapters. The loose collar fitting the outside of the holder is drilled, countersunk and tapped for a square headed set screw.

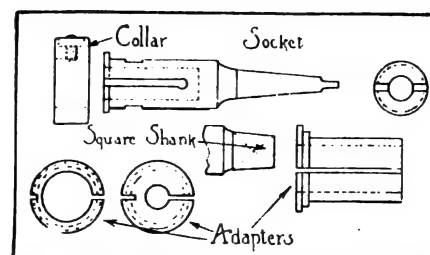


Fig. 292—Drill Holder.

The collar is slipped over the end of the holder, and the screw tightened, which operation presses the latter against the recess of the former, causing it to grip either the drill or one of the adapters. The latter are completely divided at one side, and partly slotted at the other, for the purpose of allowing them to be closed easily when pressure is applied on the outside holder. The slots should always coincide with the holder.

HOME MADE RATCHET DRILL.

(Figure 294.)

If you have need of a ratchet drill and want to make it yourself, here is one way to do it. The frame should be made by a blacksmith and in the shape shown in sketch. It should be bored to take two large coach screws for the purpose of fastening to a wall. An old milling cutter should be annealed for the ratchet and keyed on the drill spindle. A piece of strap iron should be bent in the form of a U and one end drilled and tapped to take the handle. Fit a dog with a pivoted pin and attach a spring for control, one end being secured. The feed screw can be made of round stock, threaded to pass through the frame, and the lower end recessed to fit the top of the drill spindle. A piece of piping used as in sketch will prevent slipping. The arrangement of the hand feed is obvious. As the ratchet is moved clockwise the tension of the drill is tightened by the feed screw, which turns in the same direction.

The device might be improved by welding a Y to the power part of the frame, which not only would strengthen it, but permit easy handling of large pieces of work. The tool should prove superior to a breast drill and save considerable time and labor.

HACKSAW REFLECTOR.

(Figure 295.)

A repair man is frequently obliged to use a hack saw in places where it is dark and difficult to see the work. This trouble is obviated when a reflector like that shown in sketch is utilized. It consists of a disc of sheet brass or bright metal, which is turned so that there is a collar on one side. By cutting a slot through the centre the device can be slipped onto the blade of the saw. The reflector is held by a set screw and should be enameled white to obtain the best reflection.

DRILL PROTECTOR.

(Figure 296.)

Our sketch shows a contrivance for preventing breakage of drills when boring small holes, such as .125 and .0625 diameters. In such work considerable pressure is required to make the tool cut and frequently the drills snap like glass. The device consists of a piece of hard wood, about five inches shorter than the projecting end of the drill when it is in a chuck. There is a hole through the centre, and the block is attached as shown. With this protector one can exert three or four times the ordinary pressure with safety.

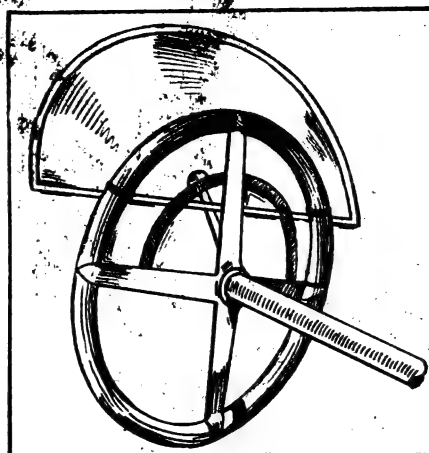


Fig. 293—Steering Wheel Shield.

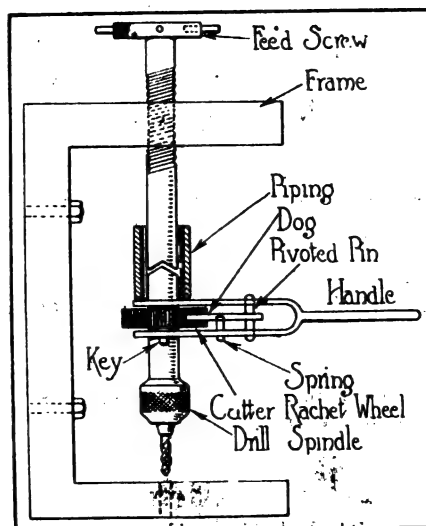


Fig. 294—Home Made Ratchet Drill.

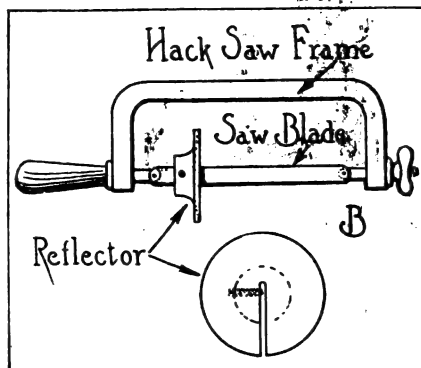


Fig. 295—Hack Saw Reflector.

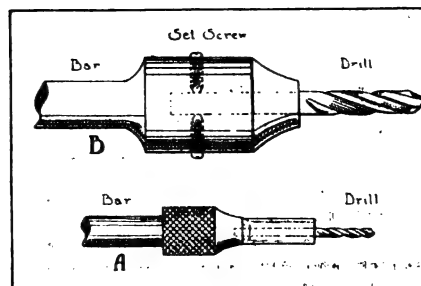


Fig. 296—Drill Protector.

A holder for broken twist drills is shown at B. These are not very costly and make valuable equipment. Frequently high speed drills become broken and thrown away because the workman has no means of utilizing them. This suggested device is designed to obviate that waste. A hole is bored in the holder the size of the drill and set screws with rounded points are placed opposite each other. These enter the flutes of the tool and make a positive drive. The other end of the holder is turned to fit the chuck.

DISCARDED WASTE.

Many garage fires have been started from a piece of discarded waste being left in some corner or under a bench, either through spontaneous combustion or by being ignited with a cigarette or spark from a smoker's pipe. For this reason care should be taken in disposing of the waste after it has become soaked with oil. It should be either placed in a fireproof can or box or thrown outside of the garage. Oxygen combining with carbon produces heat and if they combine rapidly enough a flame results.

PAINT AND TEMPERATURE.

A paint that will indicate temperatures between 70 and 140 degrees, by changing its color, can be made from 100 parts each of iodine of mercury and iodine of copper, rubbed down carefully with sufficiently distilled water to form a spreadable paste. The paint will be red in color at ordinary temperatures, but will darken as its temperature is increased and become black at 140 degrees. It is sometimes used to show the heating of inaccessible machine parts.

RAIN PROOFING WINDSHIELD.

To avoid the necessity of lowering the windshield in rain storms, owing to the collection of water on the front of the glass, which obscures the vision, a solution of soap may be applied which will keep the glass transparent. A small quantity of semi-liquid or soft soap should be made into a thin paste with water and applied evenly over the inside and outside of the glass, leaving a thin film. While this is hardly noticeable to the eye, when the rain or moisture strikes the surface it will run off, leaving a clear vision.

METHOD OF TESTING SOLDER.

One method of testing solder to determine its quality is by holding it near the ear and bending it. If it is good it will cringe and make a crackling noise, but if it bends without any noise it is of inferior grade. Solder can be made by melting equal parts of tin and lead in a ladle. It should be stirred while melting and run off into a mold to cool.



How Pierce-Arrow Provides Dinner for 900 Employees at One Time in the Huge Factory Dining Room at 15 Cents Each Meal. There Are 39 Tables, Each Seating 25 Men, and There Is One Waiter to Each Table. In the Open Market the Meal Would Cost About 35 Cents.

The Business Side of the Motor Industry

The Luverne Automobile Co., Luverne, Minn., has issued \$50,000 cumulative preferred six per cent. stock, which is being offered for subscription. The additional capital is being raised to increase the production facilities of the company's plant.

The Western Motor Appliance Co. has been incorporated in Michigan to manufacture a carburetor designed to use either gasoline or kerosene. The plant will be located at Alma, Mich., where the company was given a site of 16 acres, on which a \$15,000 plant is to be erected.

The Britton Carburetor Co., Cleveland, O., has been organized to manufacture a carburetor of that name. The company is capitalized for \$50,000. L. M. Diehl, A. C. Diehl, P. C. Jobes, C. F. Schultz and G. C. Middleton are the incorporators.

The Fergus Motors of America, Inc., has removed its offices from 80 Maiden lane, New York City, to its plant at 370

Jellif avenue, Newark, N. J. The company will manufacture the Fergus car, which was developed in Ireland.



Richard H. Taylor, Chicago
Mgr. of Zenith Carburetor Co.

Richard H. Taylor has taken over the management of the Chicago office of the Zenith Carburetor Co., located at 1507

Michigan avenue. He has been in the automobile industry for 15 years, starting with the White company in 1901. In 1909 he joined the General Motors Co., specializing in carburetor work, and his success attracted the attention of the Zenith company. He joined Zenith as sales engineer in 1912.

The Cruiser Motor Car Co. has been incorporated with \$50,000 capital stock to manufacture a specially designed car to be equipped with a complete camping outfit, and to be sold for \$1175. The company is using a temporary factory at Joliet, Ill., and the main offices are in Portland, Me., but a permanent factory is to be secured at Chicago, where the executive headquarters will also be established. W. J. Burdick of Indianapolis, Ind., is president of the company. Winthrop Burdick of Chicago is treasurer and Dwight S. Bobb of Chicago, secretary. It is planned to increase the capital stock to \$250,000.



Officers of the Elgin Motor Car Corp., Chicago—Left to Right: President, Frederick L. Brown, Also Prominent in Chicago Assn. of Commerce; C. S. Rieman, Vice President and General Manager; G. Vernon Beck, Sales Manager, Formerly with Chalmers and Detroit Companies; Clarence F. Jamison, Asst. General Manager, Formerly General Sales Manager for Saxon; W. G. Knoedler, Secretary and Treasurer, and Also President of Argo State Bank; F. X. Devlin, Purchasing Agent, Formerly with Federal Motor Truck Co.



Members of the Chalmers Girls' and Men's Clubs Delivering Christmas Supplies to the Poor in Detroit.

The Bosch Magneto Co. of New York has made contract with the following companies to use Bosch magnetos during the current year: Baker-R. & L. Co., Cleveland, O.; Krebs Commercial Car Co., Clyde, O.; Harroun Motors Corporation of Michigan, Wayne, Mich.; Ben-Hur Motor Co., Willoughby, O.; Laverne Automobile Co., Laverne, Minn.; Chandler Motor Car Co., Cleveland, O.; Drexel Motor Car Corporation, Chicago, Ill.; Lewis-Hall Iron Works, Detroit, Mich.; Hahn Motor Truck and Wagon Co., Hamburg, Penn.; Available Truck Co., Chicago, Ill.; O. Armleder Co., Cincinnati, O.; Wichita Falls Motor Co., Wichita Falls, Tex.; McFarlan Motor Co., Connersville, Ind.; United States Motor Truck Co., Cincinnati, O.; W. W. Shaw Livery Co., Chicago, Ill.; Durable Dayton Truck Co., Dayton, O.; Thomas Evarts

Adams, Inc., New York; Independent Auto Truck Co., Davenport, Iowa.

Russel Huff, president of the S. A. E., has appointed A. L. Riker and H. D. Church and the chairmen of the standards committees to serve on the army



Three Locomobile Men Recently Promoted—Left to Right: Edwin A. Travis, Delmar G. Roos and Percy W. Hine.

board that is engaged in preparing truck specifications. Mr. Riker is chief engineer of the Locomobile Company of America and a member of Naval Consulting Board, and Mr. Church is chief engineer of the Packard truck department.

The Locomobile Company of America has announced the following changes in its executive and sales organizations: E. A. Travis, formerly assistant sales manager, becomes general sales manager. P. W. Hine has been appointed manager of the Bridgeport branch and is in charge of the service in that territory. He was formerly in the executive offices of the sales department. D. F. Roos has been promoted to the position of assistant chief engineer, and C. B. Amorous has been advanced to the sales department. T. E. Swayne has been made manager of the Los Angeles branch.

The Motor and Accessory Manufacturers has admitted the following to membership: Automatic Carburetor Co., Chicago, Ill.; Superior Lamp Mfg. Co., New York City; Amalgamated Machinery Corp., Chicago, Ill.; Warner & Swazey Co., Cleveland, O.; Metal Stamping Co., Long Island City, N. Y. The total membership of the organization is now 263.

Henry Barton, one of the officials of the General Motors Co. for the past few years, has been elected president of the Northway Motor and Mfg. Co. of Detroit, Mich.

L. L. Allyn, formerly director and secretary of the Ben Hur Motor Co., has been elected president of the company.

The Stewart-Warner Speedometer Corp., Chicago, Ill., made net profits of \$1,880,073 for the nine months ending Sept. 30, and then had a surplus of \$1,320,826. The total assets on that date were \$15,061,019.

The Goodyear Tire and Rubber Company, Akron, O., manufactured more than 3,500,000 tires during the past year.

The Portage Rubber Company, Barberton, O., earned net profits of \$232,000 in 1916, or 16 per cent. on its outstanding capital stock. Business during year increased 300 per cent., and net gain in profits was 81 per cent. B. J. Wildman has been elected secretary to succeed W. J. Anderson.



During 1916 the Plant of the Oakes Co., Indianapolis, Ind., Was Doubled in Capacity by New Additions, to Meet the Greatly Increased Demand for Oakes Products (Fans, Horns, Crank Locks and Metal Stampings). The View Above Shows the Plant at the Beginning of 1917.

Earle & Boggs, manufacturers' representatives at 1790 Broadway, New York City, and composed of Lawrence K. Earle and George H. Boggs, has been made the general eastern sales agent of the Buda Co., Harvey, Ill., maker of automobile and truck engines of that name.

The Motor Products Corp., which is now operating the plant of the Lozier Motor Co., established at Detroit, is successor to the Diamond Mfg. Co. of Detroit and Walkerville, Ont.; Vanguard Mfg. Co., Rands Mfg. Co. and Universal Metal Co., all of Detroit, and the Superior Mfg. Co. of Ann Arbor, Mich. The Motor Products Corp. is not a holding concern; it operates all the concerns specified and under one management. All the companies will be grouped and operated under one roof in Detroit, the old plants being disposed of by sale. The men who built the constituent companies are actively associated in the management of the Motor Products Corp. Portraits of these men are shown at the bottom of this page. The output of the corporation includes hub caps, radiator parts, tubing and metal shapes, exhaust tubes, muffler cut-out pipes, molding, windshields, clutch cones, curtain carriers and other motor car parts.

The B. F. Goodrich Co., Akron, O., has established an operating committee which will handle much of the routine business of the concern that was formerly taken up by the board of directors. This committee supplements the executive committee, which is composed of members of the directorate, and will handle matters with which the members are in personal touch in their respective departments.

The Ford Motor Co., Detroit, Mich., which closed its plant last month for 10 days to assist in relieving the car shortage, resumed operations with 32,000 employees.

The New Era Spring and Specialty Co., Detroit, Mich., has appointed W. B. Canis as treasurer and general manager.

Ray W. Donohue has been appointed sales promotion manager of the Regal Motor Car Co., to succeed C. J. Landen.

Henry Ford, president of the Ford Motor Co., Detroit, Mich., together with H. Rackman and Frank L. Klingsmith, as individuals, have filed a bond of \$10,000,000 to secure the stockholders of the Ford company against any loss re-



George H. Boggs at Left and Lawrence K. Earle at Right, of Earle & Boggs, Eastern Sales Agent of the Buda Company.

sulting from the construction of the new smelting plant, until the present suit, brought by Dodge Bros., restraining the Ford company from the undertaking, has been finally disposed of. The three circuit court justices who presided in the case have accepted the bond and the Ford company can proceed in the construction of the \$12,000,000 plant on the Detroit river, which is the cause of the suit.

The Grant Motor Car Corp. has started production at the new plant in Cleveland, O., and plans to turn out 20,000 cars annually. With the increased facilities at the new plant and over \$1,000,000 worth of parts in stock, the company anticipates no trouble in meeting the big demand for Grant cars.

The Monitor Motor Car Co., Columbus, O., is planning a production of 3000 cars for the present season. Increased facilities are being provided in the company's plant.

The Packard Motor Car Co. has established a sub-branch in New York City in the Wall street district, sales rooms having been leased at 165 Broadway, in the City Investing building. The space is very small and only one car can be shown at a time, but a new model is placed on display each week.

The Detroit Motor Car Co., Detroit, Mich., has added a new convertible coupe and new convertible sedan to its line of 1917 models. The former will sell for \$1373 and the latter for \$1398.

H. H. Gildner, formerly chief engineer of the S. K. F. Co., has taken up the management of the Flexite department of the F. R. Blair & Co., New York.

Frank J. Enger, president of the Enger Motor Car Co., Cincinnati, O., who has been in ill health for several months, is reported to have shot and killed himself. He was 58 years of age and was reputed to have been one of the wealthiest men in Cincinnati.

The Walden Mfg. Co., Worcester, Mass., has changed the corporation name to Walden-Worcester, Inc., to more closely identify the company with its product, Walden-Worcester wrenches, which it has been manufacturing since 1907.

Arthur N. Goding, who has been in the automobile industry for several years, devoting most of his time to advertising, selling and sales promotion work in New England, has joined the Hood Tire Co., Inc., Watertown, Mass., as sales promotion representative. His territory embraces all of New England, in which section he is widely known among dealers, with whose needs he is thoroughly familiar.

The Reo Motor Car Co., Lansing, Mich., announces an increase in the price of the Reo six-cylinder touring car and roadster models from \$1150 to \$1250. No change in the prices of the other models has been announced, although the company does not guarantee that they will remain the same throughout the year.

The Chalmers Girls' and Men's Clubs, composed of employees of the Chalmers Motor Co., Detroit, Mich., subscribed sufficient money to provide several hundred baskets of provisions and clothing, which were distributed among needy families in Detroit at Christmas time.

The Drexel Motor Car Corp., Chicago, Ill., has appointed H. H. Scofield director of sales. Following his appointment Mr. Scofield announced the choice of L. M. Roberts as manager of the eastern territory, W. E. Hobbie as southern manager and H. E. Dickinson as middle west manager. The Chicago branch will remain under the management of C. B. Chapman.

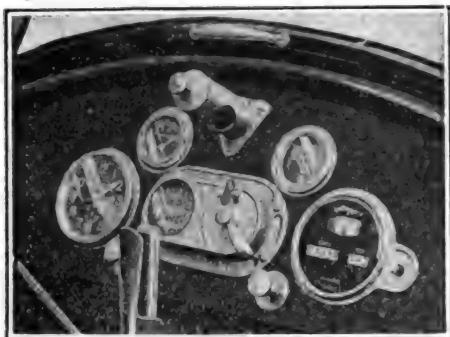
The Lutz Steam Car Co., Buffalo, N. Y., has been formed to manufacture automobiles propelled by steam.

The Kelly-Springfield Tire Co. has declared a quarterly dividend of four per cent. on the common stock, payable Feb. 1 to stockholders of record on Jan. 15.

The Hoover Steel Ball Co., Ann Arbor, Mich., has increased its capital stock from \$500,000 to \$1,800,000.



Officers of the Motor Products Company, Detroit, Mich., from Left to Right: W. C. Rands, President; C. F. Jensen, Vice President and Director of Purchasing; H. H. Seeley, Vice President and Director of Sales; D. B. Lee, Treasurer and General Manager; M. L. Brown, Secretary; R. R. Seeley, Production Manager.



The Tendency Noted is to Locate All Instruments and Controls Within Easy Reach—This is the Marmon Method.

(Continued from Page 15.)

In the King models this lamp serves both the purpose of a rear tonneau light and trouble lamp. It sets in a socket at the centre of the middle cowl and illuminates the rear tonneau, or can be taken out and carried to any point on the car, having a long, flexible cord, which winds up on a roller when the lamp is returned to its fixture.

Opera lights are also found on several models, being installed at the centre of the top in front.

A thorough inspection of the exhibits at the New York show gave the impression that the American manufacturers are at last turning their attention to details that have distinguished foreign designs for a number of years. Innovations in the form of minor refinements are to be found throughout the 1917 models, and the result is extremely pleasing both to the eye and makes for a passenger's comfort. With a heater installed, a luncheon outfit, a "dictaphone" speaking tube, smoking set within convenient reach, foot stool, hat rack over head and reading lamp back of his right or left shoulder, there is little left to desire in motor cars to complete one's comfort.

Windshield cleansers that can be operated from the inside by the driver, electric annunciators communicating with the driving compartment, new instrument board arrangements, speedometers set at an angle and many other novelties could be enumerated if space permitted.

As to colors, there seems to be no uniformity. In the higher priced models the deep hues of black, blue and red are used quite generally, although taking the new models in general no one color predominates. Natural and Brewster greens, Italian lake, cobalt blue, vermillion, ivory white, battleship gray, maroon and many other colors and tints are employed on bodies and running gear. The custom has also become more general among manufacturers of making the color scheme optional with the purchaser, and in some cases the makers also permit the buyer to select the upholstery material to harmonize with the color scheme.

The first impressions gained from viewing the big collection of new models are that the enclosed body type has become generally popular and that the in-

teriors and equipment reflect more strongly than ever the influence upon the designers of the fact that the opinion of ladies must be catered to in increasing the salability of their product. Women are far more exacting in their judgment of cars and the manufacturers know that to keep their machines in a favorable light with the fair sex they must pay strict attention to the detail of refinements and equipment, a fact which is strongly evidenced by this year's models.

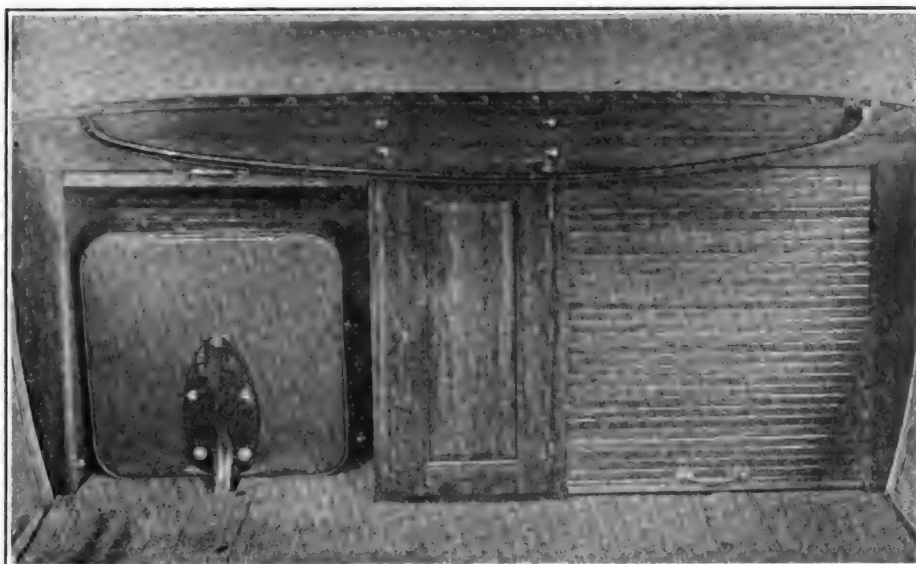
To discuss separately the individual innovations of the year, the improvement made possible in the seating arrangement by the use of the two-way seats seems to be of first importance. The Hodge and Graves two-way seat as installed in the Reo enclosed types, for example, enables the occupants in the auxiliary seats to face either the front or rear, and when not in use can be

than passing interest in the new King models. The seven-passenger model has a small combination dome light and trouble lamp, which fits in a socket in the centre of a panel between the auxiliary seat compartments under the centre cowl. There is also in this model a special drawer arranged under the right front seat for carrying tools.

The four-passenger foursome and the three-passenger runabout have special carrying compartments for small luggage, located at the top of the rear deck, which comes up flush with the tops of the seat backs and can be gotten into without leaving the car. The cover is hinged, swings backward and is provided with a lock.

A change has also been made in the King radiator, the front being in the shape of a shield similar in form to the King trade mark.

Paige enclosed cars are distinguished



This is the Way in Which the Auxiliary Seats Are Arranged on the McFarlan Models, the View at Right Showing the Compartment Closed—Chalmers Also Has This Arrangement of Its Auxiliary Seats.

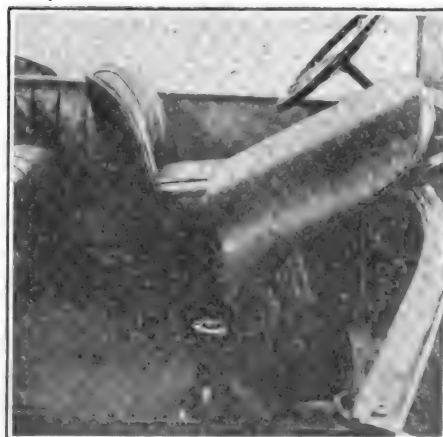
folded away out of sight as the regular auxiliary chairs do in many cars. In other makes, of the four or five-passenger type, the front seat beside the driver is of the individual type, being separated by an aisle way from the other, and can be swung around so that the occupant faces the rear.

In the Franklin sedan and brougham the right front seat is on a standard with a swivel and hinge so that it can be either tilted forward to make room for passengers entering the tonneau or can be swung around to face in any direction.

The auxiliary seats on the McFarlan and Chalmers cars when not in use fold in a compartment underneath the centre cowl. Hard wood roller panels pull down over the enclosures, completely concealing the seats and giving the back of the cowl a very luxurious appearance. Between the two roller panels on the McFarlan there is a plain panel forming the door to a compartment for miscellaneous articles.

There are several refinements of more

by the most up-to-date lighting systems. In addition to the dome light there are in one model oval corner reading lamps,



Tilting Front Seats Are Used by Franklin and Several Other Makers—They Facilitate Entrance and Are Reversible.

step lights and an opera light. This car also has a pointed windshield built in two sections, which harmonizes with the lines of the radiator. The windshield has the advantage of being used as a rain vision type on the driver's side, while the other half remains closed.

Pierce-Arrow enclosed body types have been improved and refined in a number of respects with the object of simplifying the lines in many cases to obtain added elegance. The sides of the open bodies are slightly higher and the seats set lower. The lines and mouldings have been somewhat altered and the rear mudguards fit closer to the wheels. Arrangements for storing the "jiffy" storm curtains have been simplified and the cape top has been improved so that it is more easily handled. A locked pocket has been provided in the left front door for the small tools, which serves to keep them in a handy place and at the same time in better condition. Disappearing auxiliary seats have been adopted in place of the folding type.

In the Allen roadster there is a large baggage compartment located under the rear deck, with room for two or three casings or suit cases. It is provided with a long curved door with concealed hinges, which fit flush with the deck and makes the joints water proof and dust proof, eliminating the danger of injury to parcels or baggage in stormy weather.

Buick features for 1917 include special equipment in the enclosed bodies, use of Perfection window regulators, opera and step lights, double rain vision windshields, rope robe rail and hat rack, the latter being suspended from the underside of the top coat hangers, and other conveniences. The two-passenger cabriolet model has extra large side windows in the bonnet, made of celluloid, which greatly increase the range of vision of the occupants when the top is up.

The two new Paterson models for 1917, which include a new design of touring car body and a four-passenger chummy roadster, the latter introduced this year for the first time, have several appointments and refinements of unusual interest. A tool compartment of special design is located in the left front door, in which a separate pocket is provided for each tool. The compartment is protected by a flap, which buttons snugly over the pockets and keeps out rain and snow.

Distinctive body lines are shown in the Hackett open models, and while strikingly original, give the cars an exclusive appearance. The outer upper edge of the body forms a straight line from the radiator shoulders, running back around the tonneau. The deck thusly formed also extends across the centre cowl and the top of the hood and front cowl, which are flush, are formed with a gradual curve, giving the effect of the fore deck on a motor boat. A rakish windshield accentuates the nautical lines.

In the Packard special bodies exceptional refinement and complete equipment are the noteworthy features. Vanity cases, with mahogany covers, smok-

ers' sets and pearl enameled fixtures enhance the appointments of these beautiful interiors, and as fixtures harmonize with the elegant upholstery material employed. Special ventilators for the driver's compartments are found on these cars. One type is in the form of a hinged door which, when opened by a lever from the instrument board, admits air along the entire top of the dash.

An Oakland car, with a victoria top and pointed radiator has a tonneau windshield of the folding type like a French dresser, mounted on the centre cowl. The effect of the combination of these three features is very pleasing and strikingly distinctive.

The interiors of the Chalmers models, which are finished in fabric materials, the selection of which is made by Lady Duff Gordon, the well known fashion authority, are extremely beautiful and with complete fittings, including toilet case, foot rests, dome lights, reading lamps, flower vase, roller curtains and auxiliary seats that are extremely cozy and comfortable. The cars are specially well lighted, the brougham having, besides the dome lights and reading lights, an opera light on the roof in the centre, step lights and flush pillar lamps of attractive design on either side of the windshield, set in the body. Windshield cleaners are also fitted on some models.

In the new Majestic special attention has been given to the tonneau equipment, although the rounded radiator and special type of headlights are also distinctive features. In the tonneau there is a large compartment with mahogany paneled cover, which is large enough to hold a complete luncheon outfit. The door of the compartment is hinged so that it can be raised and supported to form a neat table for serving luncheon. Another compartment is fitted with a cigar lighter and contains a vacuum ice box, and still another compartment is fitted with a vacuum ice box. A ladies' toilet set and cushion foot rests are also in the equipment.

The custom made bodies on the Roamer cars, which to a considerable extent follow out the lines on the English Rolls-Royce cars, set low on the chassis and have a pronounced foreign appearance. One car at the New York show attracted particular attention because of its unique windshield, which is made of two oval pieces of heavy plate glass, set side by side like the lenses in a pair of spectacles.

Larger and more luxurious bodies are mounted on the Bour-Davis chassis this year, with very complete equipment. One of the models at the New York show was fitted with a rear view mirror mounted on the left front mudguard, tilting steering wheel, windshield cleaner and auxiliary lamps and reflectors in the headlights for driving in the city. The upholstery is of genuine leather, supported by patented cushion springs; the carpets are of hair cloth and the metal trimmings on the top are of German silver. The tonneau is equipped with an automatic cigar lighter and the tool kits are set in special compartments provided for them in one of the doors.

Consistent refinement throughout is the effect produced by the designers of the American Six, which is an excellent example of the product of the coach maker's art. The colors are deep and the upholstery is of long-grained genuine leather. The floor of the tonneau is carpeted with a soft rug and the running boards are laid with linoleum bound by aluminum. The front dash and back of the centre cowl are paneled with walnut. The front panel is inset with another panel on which is mounted the entire instrument assembly. A heavy leather rope robe holder is installed on the centre panel and can be detached at either end.

A very striking job is presented in a Cunningham Victoria equipped with disc wheels. Double windshields are mounted on the front and centre cowls, and the side lamps are mounted on the tops of the mudguards at the front and on a level with the headlights.

A four-door Springfield type of convertible body on a Cole chassis was the outstanding feature in the Cole company's booth. This new type of body has sliding glass panels between the driver's compartment and the tonneau and in effect gives three cars in one. With the panels in position and the side windows up the car is a town limousine. With the glass panels removed, which is done very easily, one has a sedan, and by dropping the side windows the car becomes an open touring car with a permanent roof.

The silver gray Ben-Hur exhibition car, a new clover leaf roadster, apart from its unusual finish, attracted much attention because of its "thoroughbred" appearance and its attention to details. Its A-Z pointed radiator and tilted windshield gave it the appearance of great speed, while its roomy seating compartments indicated riding comfort to a high degree. The closed Ben-Hur bodies include all the usual equipment of cars in the \$2000 class, tonneau lights, robe rails, foot rests and roomy side pockets in doors, with carpeting in camel gray.

Blue and gray predominated in the Owen-Magnetic display, these colors being the new finishes in which these cars are now offered. Both open and closed models were shown, there being two touring models and a coupe, a town car, a landaulette and a limousine, the closed cars being finished in Holland blue, light blue, Pittsburg smoke and waistcoat gray respectively.

The Metz models, the cars with the friction drive, attracted more than their quota of intelligent investigation. The standard models were displayed at Grand Central Palace, while at the company's New York sales rooms there was a new Victoria body with very striking lines.

Among the low priced four-passenger roadster types shown there was the new and graceful Elcar model which has an unusually high centre cowl that adds materially to the appearance of this kind of a car. The Elcar line also includes a convertible sedan, a four and a five-passenger touring car and a two-passenger roadster.

300 at N. A. C. C. Banquet

Annual Dinner to Members and Guests at Waldorf-Astoria a Huge Success

The annual banquet of the members of the National Automobile Chamber of Commerce, held in the Waldorf-Astoria on Tuesday evening, Jan. 9, was the occasion of much merrymaking by the leaders in America's new billion dollar industry.

Col. Charles Clifton, president of the organization, presided and introduced the only speaker of the evening, Job Hedges, who spoke on subjects pertaining to preparedness. The post prandial exercises otherwise were confined to holding a mock trial and decorating several of the well known members with fictitious titles and honors.

The mock trial was take-off on the suit brought by the Dodge Bros. against Henry Ford. Characters representing the principals in the suit testified, as did also several members who were called as witnesses to enlighten the body of 12 men, tried and true, that heard the evidence. R. E. Olds, William E. Metzger and C. C. Hanch received high and honorable titles during the subsequent entertainment, which provided a good laugh all around. About 300 members and guests were in attendance.

PATHFINDER AND EMPIRE JOIN IN CONSOLIDATION.

The Pathfinder Co. and the Empire Automobile Co., both of Indianapolis, Ind., are to be merged into one concern, to be known as the Federated Motors Co., with a capital of \$5,000,000. While considerable Indianapolis capital is identified with the merger, the financing is being handled by Boughton & Co., bankers and brokers of New York City.

The names, Pathfinder and Empire, by which the two companies products are known, will be retained, it is understood, but a much larger output will be provided for by the new capital and facilities that are planned. Last year about 1000 Pathfinder cars were made and a production schedule of 2000 for the current year is planned under the new arrangements.

HOLMES COMPANY WILL MAKE AIR-COOLED CARS.

The Holmes Automobile Co., with offices and headquarters at Canton, O., has been incorporated with \$2,500,000 capital to engage in the manufacture of air-cooled cars.

The concern is being promoted by Arthur Holmes, formerly vice president and chief engineer of the Franklin Motor Car Co.; C. H. Rockwell, former sales manager of the same company, and a number of Western capitalists.

A large plant will be erected at Canton for the manufacture of air-cooled en-

gines, which will be installed in a car to be made by the company.

TIRE PRICES HAVE BEEN CHANGED SLIGHTLY.

A general advance in prices of tires and tubes of 10 to 24 per cent. has been announced by several of the largest manufacturers. The advance is ascribed to the constantly increasing cost of raw materials and labor and for this reason the trade looks upon the new lists as permanent, excepting possibly a further rise.

The United States Tire, the Goodyear Tire and Rubber and the Firestone Tire and Rubber companies have advanced casing prices 15 per cent., tubes 10 per cent. and solids from 10 to 12½ per cent.

The Kelly-Springfield tires have been advanced 12 per cent.; Lee tires, 15 per cent.; Miller tires and tubes, 10 and 5

per cent. respectively. It is understood that the Ajax Rubber Co. will soon announce a new price schedule, which will be a revision upward.

An advance of 15 per cent. on tire casings and 10 per cent. on truck tire casings has been announced by the Republic Rubber Co., while the Michelin Co. has increased tube prices 10 per cent. and the plain Ford casing sizes 12 per cent. The large size Michelin casings have been advanced 19 per cent.

The Swinehart Tire and Rubber Co. has made no change in the 30x3½ or 34x3½ casings, non-skid, but has lowered the price of the plain tread in these sizes by \$1.35 and 95 cents respectively. The Swinehart 34x3½ tubes have been advanced from \$3.75 to \$3.80.

The Continental Motors Corp., with \$18,500,000 capital, is being organized to take over the Continental Motors Co., Detroit, Mich., with the object of raising sufficient capital to double the present output of motors.

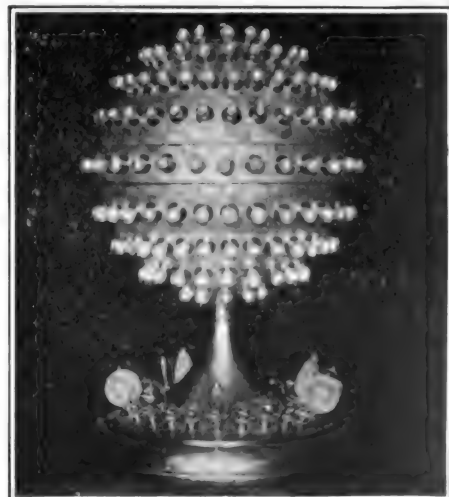
There will be no material change in the control of the company. The same officers and directors manage the new company, with the addition of two more men to the directorate.



Striking Exhibit at the New York Show.

In the accompanying illustrations are views of the J. H. Faw, Inc., exhibit at the New York show, the larger one showing the whole display, which included Faw's complete line of 15 standard automobile specialties, representing some of the most prominent manufacturers in the industry, among whom are the Culver-Stearns Mfg. Co., Fitzgerald Mfg. Co., Walden-Worcester, Inc. (formerly Walden Mfg. Co.), Ideal Clamp Mfg. Co., Oakes & Son and the Independent Lamp and Wire Co.

A feature was a stand upon which was an illuminated globe made up of Culver-Stearns fittings and the Independent Lamp company's Tungstol lamps. The current was supplied by General Lead batteries.





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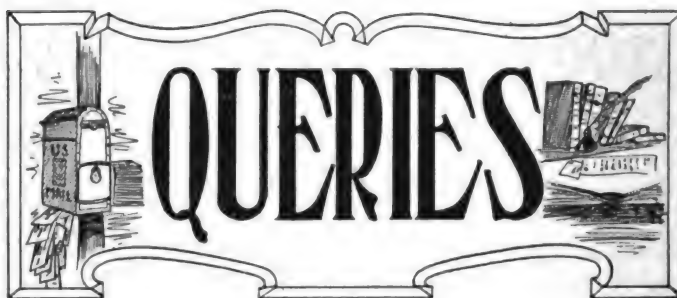
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QUERIES

NOTICE TO READERS.

THIS department contains the Mechanical Editor's answers to readers' inquiries. It is open to every subscriber. If any part of your car is not operating satisfactorily, or if you desire information regarding operating, maintaining or repairing motor cars, do not hesitate to lay your troubles before him. He will answer promptly and fully, either by mail or in these columns, as you direct. This service is free to every subscriber, and is often the means of saving considerable money that otherwise would be spent with a garage man. Letters should always be signed with the writer's full name and address, and the car or part in question should be properly identified, by mentioning the maker's name, model, year of production or other distinguishing feature. Address all inquiries to the Mechanical Editor.

CARING FOR BATTERIES IN WINTER.

(J. C. B., Ontario, N. Y.)

Can we keep the battery in our Ford car during cold weather if we run the engine occasionally, or had we better take it out of the car and keep it where it will not be affected by cold temperatures?

From your inquiry I assume that your car is equipped with an engine starter. If the battery is well charged it will not be much affected by cold, but as the battery is discharged it will be affected, and to be certain that there is a reasonably good charge the engine should be run an hour each week, in addition to the charging the battery is given while the car is driven on the road. Batteries used with engine starters are worked hard and very rarely are sufficiently charged. In cold weather the capacity of a battery is much reduced, but this will be regained in warm weather.

If the car is laid up and the battery is not used for starting, it ought to be charged once a month to maintain it in efficient condition, no matter whether it is in a cold garage or a heated building. There is not so much reason to anticipate damage from cold as from natural discharge and sulphation of the plates.

In any event the plates ought to be kept covered with distilled water and a reasonably constant temperature is best, but there is greater activity of the electrolyte on the plates when the temperature is high.

Cold weather will have no material effect on dry cell batteries.

WANTS TO OVERHAUL STUTZ CAR.

(R. H., Boston, Mass.)

I would like your opinion in regard to overhauling my car. This is a 1914 Stutz roadster. The greatest trouble seems to be a loss of "pep." Seems to have lots of compression and fairly good power, but no speed to speak of, especially on hills. It has a slight knock from one of the bearings—no piston play. Could I use an aluminum piston in such a large cylinder; would it give me better acceleration. I have a Splitdorf double magneto and a Bosch single. Advise me which you think is best for the car with all in good condition? I seemed to get better results with the double system when it was right. My garage man told me that I ought to have the cylinders rebored this winter. He ought to know, but I believe if there was considerable wear of the cylinders there would be a loss of compression. I wish to put the car in good shape and would like to get a faster "getaway."

Many causes may be specified for what you state to be "loss of pep." You mention the engine compression is good,

but it has no speed to speak of. If you get good compression the cylinders must be in fairly good condition. I would suggest grinding the valves very carefully being sure that you have no worn valve stems or valve guides, for either of these conditions would greatly reduce your speed. See that the spark is not set too late, as sometimes results from the magneto coupling being worn. Be sure that the exhaust pipe and the chambers of the muffler are not clogged. These ought to be perfectly free. The rear wheels ought to move freely. A dragging brake will very materially reduce the speed of a car.

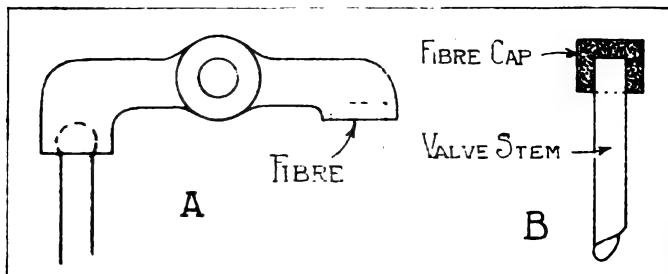
Aluminum pistons and new rings would undoubtedly, because of their lightness, give you more power and a quicker getaway. The magnetos you have are both good, but if the Bosch is in good condition the system is the simpler, and simplicity is always desirable. Either magneto can be put in excellent condition by taking them to the respective service stations of the manufacturers in your city.

FIBER ROLLS FOR SILENT OPERATION.

(E. B. McC., Glen Ridge, N. J.)

I have a D-Six-45 1916 Buick car. Please inform me where I can buy fiber tips for silencing the overhead valves. I understand such tips are made, but I am unable to find any concern that sells them. In your Nov. 25 number you mention fiber rollers, which is the principle to which I refer, but these would not fit a 1916 Buick car.

Fitting fiber valve tips to a Buick car is an almost impossible job, so far as insuring satisfaction is concerned. The writer has, however, seen fittings made that have been reasonably efficient. As will be noted, these are comparatively



Methods of Fitting Fiber Rolls to Obtain Silent Operation of Valves.

simple. The method indicated as A consisted of drilling a hole of the desired size in the contact end of each valve lever to the depth of a sheet of fiber. A series of discs approximately .002 inch larger in diameter than the drilled hole were punched from the fiber sheet, and these were hammered into the drilled holes in the levers, filling them even. These fiber discs silenced the valves and could be renewed as often as worn. The method indicated as B on the accompanying sketch was simply turning a series of fiber caps from block fiber to dimensions so that they snugly fitted the valve rods or stems. Of course these wore, but they could be easily replaced. Fiber can be obtained in sheet or block at any large hardware store or mill supply house. Can't you eliminate the noise by adjusting the valve push rods?

WORN VALVE GUIDES AND STEMS.

(A. B. S., Hartford, N. Y.)

I have a 1913 Metz car in which there is a very bad knock and I think it is in the valve guides, which are worn some, as are also the valve stems. Would new guide bushings eliminate all knocking, or would new valves be necessary also?

Yes to both questions. Invariably when the valve guides are worn the valves will also evidence wear. You can easily determine whether new valves are necessary by caliper the stems to learn if they are badly worn. New valve guides and valves will considerably increase the power of the engine if the valves you now use are worn badly. The cost is insignificant compared with the increased efficiency of the engine.

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WANTS TO KNOW ABOUT COOLING.

(R. J. M., Bridgeport, Conn.)

Would there be any advantage gained over the present water cooled gasoline motors if a system were designed to keep the cooling medium at any desired temperature, within a range of five degrees, regardless of the weather conditions or change of speed, and to what extent is this done at present and what should this constant temperature be? I understand that most of the multiple unit engines, as the Packard 12 and Cadillac Eight, are fitted with thermostats, which control the flow of water around the jackets and are set for 170 degrees, but do they actually hold the temperatures at that point in winter and summer, also when running long in first and second speeds?

Were cooling liquid in the radiating system of any internal combustion engine kept constantly at the most efficient temperature this would be within or slightly less than the boiling point—212 degrees Fahrenheit. When the boiling point is reached the water is dissipated as steam and the volume is reduced. If boiling is continued and there is much loss of water the level may be so lowered that parts of the cylinder jackets are not cooled (if the system be thermo-syphon circulation), but if the circulation is by pumpage this condition will not obtain so long as the pump inlet is continuously submerged.

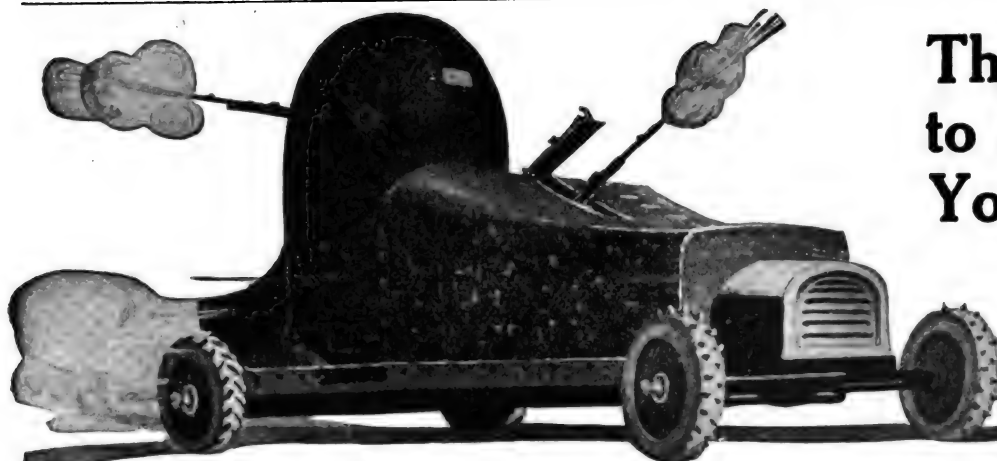
Of the heat generated in an internal combustion engine, assuming the fuel is entirely consumed, and the engine is functioning normally, from 18 to 20 per cent. is converted into useful work, from 25 to 30 per cent. is lost through the exhaust and from 50 to 55 per cent. is lost through the cooling or radiating system. A long series of tests by Carpenter and Diederichs showed that in varying operating conditions the cooling (radiating) losses ranged from 25 to 50.4 per cent., and the exhaust losses ranged from 23.4 to 55 per cent. These have been confirmed by other authorities.

The temperature in a cylinder may reach 3200 degrees Fahrenheit. The melting point of gray cast iron is approximately 2250 and of platinum 3225. Approximately 900 degrees Fahrenheit will heat iron or steel red. Obviously the cylinder and piston and valves will distort if heated red. Probably 600 degrees of heat exists on the internal cylinder walls of a water jacketed engine. The water must necessarily be heated to boiling unless circulated and cooled. Ordinarily eight to 8.5 square feet of radiating surface is provided in an automobile radiator for each rated horsepower of the engine. This is expected to afford adequate radiation—that is, for continuous operation at normal engine speeds.

Thermo-syphon circulation will be begun when water is heated to approximately 180 degrees. Because there is only an absorption of 32 degrees between the beginning of thermo-syphon circulation and dissipation (boiling), the thermo-syphon cooling system will contain a larger volume of water than the system in which the water is pump circulated. Theoretically the efficient radiation of the heat depends upon the velocity of the air drawn through the radiator. The cooling influence of the air draft may be judged from the fact that an aeroplane radiator is approximately one-third the size in cooling area of the automobile, having an engine of the same rated capacity.

Because the volume of water of a cooling system is ordinarily not variable and is at the temperature of the atmosphere when the engine is started, it must be heated. As the temperature of the water increases the fuel better volatilizes and the lubricant becomes more viscous and efficiency develops until water is close to boiling. Some believe that the maximum efficiency is obtained when the water of the cooling system is boiling, but as the water dissipated as steam cannot be conveniently replenished and there is no means of indicating the volume in the system, there is the danger of the engine being excessively heated, lubrication is impaired and the bearing may be softened and the pistons may "seize."

Boiling the cooling liquid is generally a danger signal for experienced drivers. Very rarely, however, is the cooling system of a pleasure car sufficient to allow a considerable period of driving at low or intermediate gear ratio without boiling. This condition will be observed after climbing long hills or



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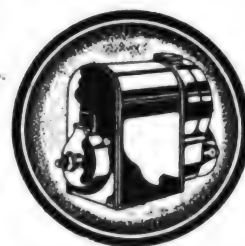
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driving in sand. There are two reasons for this—the reduced circulation of air through the radiator and the comparatively fast work of the engine. When an engine is used in a truck it will require a larger radiator than were it used in a pleasure car, for there is material reduction of the cooling influence of the draft of air through it.

One of the most noticeable effects of vehicle movement is in carburetion. If a carburetor is adjusted to give a precise result—that is, a mixture that affords efficient and smooth operation—when the vehicle is not moving, there will be a decided change in the action of the engine as soon as the machine is started, and this will be due to the reduction of temperature from the increased circulation of air through the radiator and around the engine. This applies, of course, to settings that are very close and which are carefully observed. What appears to be a very practical regulation is varying the area of the cooling section of the radiator through which the air is drawn. The velocity in feet per second is indicated by the following: 10 miles an hour, 14.67; 15 miles, 22 feet; 20 miles, 26.4 feet; 25 miles, 36.67; 30 miles, 44.01; 40 miles, 58.68 feet; 50 miles, 73.35; 60 miles, 88.02 feet; 70 miles, 102.5 feet. In addition to this circulation by vehicle velocity there is the draft caused by the fan, which is proportionate to engine speed. The power of the fan is whatever may be recommended to or determined by the engine designer.

From what has been stated one will understand there are two factors that are very widely variable, the velocity of the cooling liquid and the velocity of the air through the radiator. These, to maintain a precise temperature, would of necessity have a definite relation to each other, and obviously there would be need of regulation. No engineer has as yet accomplished this regulation.

The cooling of the Packard Twin Six engine is controlled to this extent. When the engine is cold the water is circulated through the water jackets of the cylinders only. When water heats a thermostat actuates a lever in the housing of the thermostat that closes a valve in the inlet passage from

the rear cylinder block manifold and opens a valve in the passage leading from the bottom tank of the radiator. This allows a circulation of the water through the radiator and engine jackets in the usual manner. There is no adjustment for the thermostat. A motometer indicates when the radiator is heated to nearly the boiling point. The regulation of the cooling system of the Cadillac cars is similar. The real purpose of the thermostat control is to warm the engine quickly, and after that to insure the cooling of the engine in any operating condition that may be regarded as practical. After the full cooling system is in use there will be precisely the same condition as in any other vehicle until the liquid has cooled.

There is another factor that must be considered. Denatured alcohol is used by many drivers to form a solution to fill the cooling systems, because alcohol will prevent freezing, and as high as 60 per cent. solutions are not infrequent. Such solutions, however, will boil at considerably reduced temperature, and this lessens the efficiency of the system in cold weather. The variability between water and water-alcohol liquids cannot be stated, because the ratio will differ with each cooling system.

LEAKS GAS THROUGH PISTON RINGS.


(W. E. H., Syracuse, N. Y.)

I have a 1915 Ford roadster, driven about 10,000 miles, which I think leaks gas through the piston rings. The compression is weak, especially in No. 2 cylinder, notwithstanding the fact that the valves were cared for several times this season, and by Ford service the last time. How can I decide the exact cause of this trouble and how can I overcome it? I ran some distance with the oil level too low, which would cause trouble such as I mention. I have no records of mileage, but the car gives good service in every way except at low speed, and the engine appears to spin after the switch is opened.

Poor compression is generally caused by leaky valves. Are

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you positive that the valve seats are in good condition? Examine the cylinder walls for a scored cylinder, learn if there is a loose piston, a broken piston ring or a piston ring stuck in its groove. Any of the above, or the use of poor or cheap oil, would cause poor compression. They are easily remedied. A scored cylinder can be made equal in efficiency to the others by reaming or reboring and fitting new piston and piston rings. Examine the valve seats closely. Possibly you have fitted valve adjusters and have the valves adjusted too close. If your only trouble is that the engine runs uneven when throttled low, look for an air leak in the fuel intake, possibly around the copper gasket, or the ferrule that supports the intake gasket is bent and prevents the intake being absolutely air tight.

DESIRES TO CLEAN STORAGE BATTERY.

(H. J. P., Rogersville, O.)

During the past summer the Willard storage battery in my Studebaker four touring car gassed so much that the replenishments of distilled water very much reduced the acidity of the electrolyte. Can I pour out the electrolyte by turning the battery upside down, clean it with distilled water and refill it with fresh electrolyte? Would the process I have outlined be practical?

The battery could not be cleaned as you have suggested. In the bottom of the cells are deposits of sediment, which are really particles of lead peroxide that have been broken off or "shed" from the positive plates and precipitated. There is a space beneath the plates of each cell (the plates rest on high ribs that are known as bridges) to receive the sediment and insure against it contacting with the plates. With each charge and discharge of the battery the plates contract and expand, and the accumulation begins with the first use made of the battery and continues until the positive plates are no longer serviceable.

You will understand that to invert the battery to pour out the electrolyte would necessarily wash the sediment between the plates and separators and around the plates, so that there might be short circuits resultant. No "washing" that would appear practical would insure the removal of the particles from the plates, and in the event of renewal of the electrolyte particles so remaining on the plates would result in local action—each particle having a polarity opposite to that of the plate on which it would be fixed, and forming in each instance a miniature cell in which charge and discharge would alternate, as between positive and negative plates, and poles would be pierced into the plates, and, eventually, through them.

There is but one way to clean the sediment from the cells—and this work is not often undertaken by an inexperienced man—which is removal of the plates from the cells, thoroughly washing the plates and jars, renewal of the wood separators (probably) and reassembling. Before this is done the battery should be fully charged and this means until there is no longer rise of voltage.

The battery cells have two terminals each, and these cells are connected by different type connectors, some being what is known as "bolted" and the others being "burned," lead burning meaning fusing the metal until it flows and the connection is made without joint. In disassembling cells with burned connections of the pillar posts, holes are drilled with half-inch machine drills where the pillar strap connectors are burned to the pillar posts, and the connectors can then be lifted off. The connectors may be cut with a hack saw between the pillars, but this is not as satisfactory as drilling. If the connections are bolted these may be unscrewed. If the cells are sealed with soft rubber gaskets the gaskets may be removed and the cover taken off. If sealed with a hard compound this can be removed with a heated putty knife.

When the element (the plates) is exposed, one series of plates should be removed at a time and placed on its side with the plates vertical. These can then be washed with a stream of water and any deposit on the plates that the water will not remove should be scraped off with a stick of wood. The wood and rubber separators should be removed. The wood separators can be discarded for new, but the rubber



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separators may be again used if not cracked or broken. Immediately upon washing, the negative plates should be placed in distilled water, for if exposed to air they will absorb oxygen and heat, and if the battery is not to be immediately re-assembled they should be placed in electrolyte. The positive plates will not heat when exposed to air.

Assembling the battery—assuming the jar and the separators of each cell have been thoroughly cleaned—the element is placed with a positive plate between each negative plate, and the separators are placed with one rubber and one wood between each plate. The rubber sheets contact with the positive plates and the flat sides of the wood separators contact with the negative plates. The bottoms of the plates and separators should be just even. The plates and separators should be pressed together and squared with each other so that the assembly can be placed in the jar and seated on the bridge at the bottom. The hold downs, the rubber or wooden pieces that were between the tops of the separators and the straps connecting the plate lugs, should be placed, the purpose of these being to prevent the separators rising and insuring against short circuiting at the bases of the plates. The covers of the cells are then put on and re-sealed.

The electrolyte should be placed in the cells before the covers are put on and this ought to be about 40 degrees higher in specific gravity than the electrolyte that was in the cells, which increase of gravity compensates for the water in the wood separators. If the old separators are used the specific gravity should be the same. New electrolyte can be made by mixing chemically pure sulphuric acid, 1.842 density, with 4% parts of distilled water by volume to obtain 1.200 density, and one part of acid to three parts of distilled water to obtain 1.275 specific gravity. When mixing, pour the acid slowly into the water, stirring it thoroughly with a wooden paddle. The solution will heat when the acid is mixed and the final reading must be made when it has cooled. The mixing must be done in a glass or earthenware vessel. If the plates have been kept wet there will be no rise of the temperature of the cells when the electrolyte is poured into them.

After covers have been put on the cells may be temporarily connected. The plates and the wood separators will absorb some of the electrolyte, so this must be observed to see that the plates are well covered. Care should be taken to connect the positive terminal of each cell to the negative terminal of each cell, with one positive and one negative terminal of the end cells for the connection of the generating and lighting circuits. The connections must be either burned, or, if the bolted type, the pillars, connectors and nuts must be coated heavily with vaseline to prevent corrosion. The battery must be then fully charged and the electrolyte brought to the required specific gravity. The battery should then be charged at a rate not exceeding one-fourth of the normal discharge rate, and this should be continued until both the voltage and specific gravity reach a maximum, and to be sure that this maximum has been obtained the readings should be alike for a period of not less than 10 hours. There should be allowance for temperature variation, for the specific gravity will decrease one point for each three degrees rise in temperature, and it will correspondingly increase for each three degrees fall in temperature. The maximum gravity will be approximately 1.280 at 80 degrees Fahrenheit, and the maximum voltage should be between 2.55 and 2.70 with the charging current flowing.

Upon completion of the charge the height of the electrolyte should be adjusted to be about one-half inch above the tops of the plates. The battery will not have its maximum capacity until it has been charged and discharged three or four times, when the specific gravity of the electrolyte should be adjusted to be approximately 1.285 when fully charged.

You will note that the work you purpose to do will require much time, careful attention, and is really very delicate. The result may very likely result in disappointment, and for this reason the better judgment would appear to be having the restoration done by some good battery service station. Such work would be guaranteed. You will be surprised at the seemingly small cost and you can rent a battery while your own is being restored, thereby keeping your car in service.

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READING PREST-O-LITE GAUGE.

(F. E. B., Newark, N. J.)

How does a person read the gauge on a Prest-O-Lite acetylene tank? There are two scales on the gauge of the tank I have. I understand that the top scale shows the pounds pressure. What does the lower scale show? Another point: Why is it that when a car with tank attached is in a garage the gauge will show a greater pressure than when it is out doors? I enclose a drawing of the gauge to show what I mean.

The two scales you mention are to show the pressure in pounds and also what is known as atmospheres. The top-most scale, as you state, indicates the pressure in pounds, while the lower registers it in atmospheres. For example, when the Prest-O-Lite company fills a tank the scale in a 60-degree temperature, Fahrenheit, will register 225 pounds on the top scale. On the lower scale the needle will indicate approximately 15 atmospheres.

Heat and cold cause the variation of the registration you mention when the car is in the garage. During a hot day the gauge on an acetylene tank that has been freshly charged will show as high as 315 pounds pressure, or even higher, depending upon the heat. On a cold day the same gauge may show only 135 pounds. The last named mark is of course much lower than the mark on the tank reading "full," but that fact does not mean the customer is not receiving full

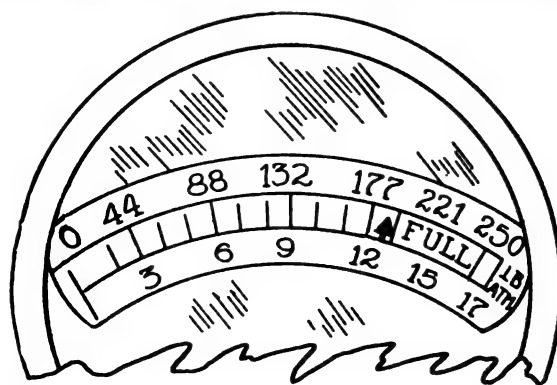


Illustration of a Prest-O-Lite Tank Gauge.

value. The contents are determined by weight and not by volume. The gauge is attached to the tank for the user's convenience, to show how much of the light supply remains, but in no manner does it indicate the exact contents in cubic feet.

METHOD OF TIMING IGNITION.

(E. N. H., Lansing, Mich.)

I recall reading in some paper about a year ago about how an Englishman made a chart on which to test the timing of valves and ignition. I believe the article appeared in your paper. Can you tell me what the method was?

The suggestion you probably refer to appeared in the Jan. 10, 1916, issue of The Automobile Journal, and was based upon a suggestion that appeared in Autocar, a British motoring publication. In that issue of our magazine we said:

"Although the method suggested is not an absolutely accurate test, it is near enough to afford a practical check on the timing. The only material required is a piece of stiff cardboard, cut in the form of disc, 20 inches in diameter.

"A hole of the same size as the shank of the starting handle is cut in the centre of the disc, and then a small slit is made so that the cardboard can be placed over the handle. The edge of the disc is then marked off by divisions of five degrees, into a circle of 360 degrees.

"The next operation is to find the dead top centre of No. 1 piston. Usually this is marked on the flywheel, but if not, any of the methods heretofore described in these columns may be used. The placing of a small piece of wire on the piston head is one of the simplest ways. With the crank in mesh with the end of the crankshaft, when the dead top cen-

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tre of No. 1 piston has been found, the disc should be turned so that the figure 360 is directly behind the gripping portion of the starting handle. The disc can then be fixed in this position by forcing long nails through it into the spaces between the radiator tubes.

"Now turn the starting handle until the inlet valve No. 1 cylinder just starts to open. Mark 1. 0. on the disc just behind the gripping portion of the handle. This same procedure should be followed at the closing of the inlet valve and also the opening and closing of the exhaust valve. The firing point can be checked similarly. Of course a separate valve test should be made of each cylinder so that perfect synchronism can be obtained.

"With a device of this kind it is a simple matter to find the dead centre of the crankshaft and then to mark the flywheel permanently. The best method is to mark the flywheel and also the back of the cylinders, or dash, so that it will serve as a register for the mark on the flywheel. It is also well to make a slight mark on the radiator so that the disc can be replaced at any time with a degree of accuracy.

"It should be remembered that the starting crank can engage the crankshaft in either of two positions. To ascertain that the proper engagement has been made, the operator should watch the movement of the exhaust valve, as it should be practically closed when the piston has reached top centre."

DEADENING GEAR BOX NOISES.

(T. C. N., Oakland, Cal.)

A very loud grinding and rumbling noise comes from the gear box on my car when running in low. I do not feel equal to the expense of a new gear set. Is there some home made remedy for this trouble?

Worn gears, loose bearings or improper alignment of the gears produce, especially on low speeds, loud sounds, varying according to the shape and type of gear box. In the case of worn gears, after they have been overhauled and readjusted,

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the noise will continue, but can be greatly deadened by the use of heavy grease, which fills up the gaps left where the wear has been greatest. A "dope" made of heavy grease mixed with ground cork or saw dust is used by some repairers to lessen the sounds emanating from this source, but on a high grade car such an expedient is not advisable. Graphite is the best lubricant for this use, as it has a heavy body, which settles on the equalities in the gears and shafts and prevents the play which is the cause of the noise.

SEPARATING RUSTY PARTS.

(H. A. P., Lowell, Mass.)

In the course of my work around the garage I often find use for some old rusted part, but find difficulty in separating it from some other part to which it has become attached by the incrustations of rust. Is there some formula used for this purpose?

Metal pieces rusted together can be separated readily and their condition much improved by boiling them in petroleum. Care should be taken, however, not to leave the receptacle where its contents would come in contact with a naked flame. After boiling the part it should be treated with alcohol to prevent oxidization.

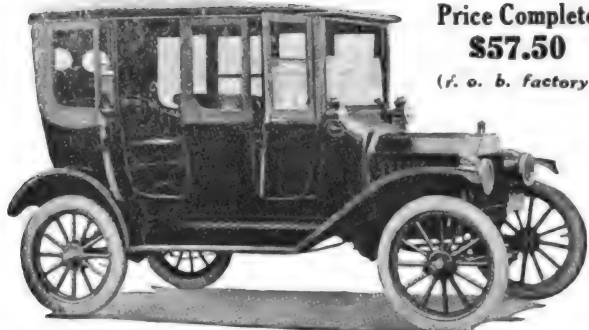
DANGER OF FILLING TANKS.

(S. H. G., Concord, N. H.)

Is there any precaution necessary in filling a gasoline tank direct from a metal can containing the fuel? I have heard that explosions have been caused by the generation of static electricity.

There was recently considerable discussion of this subject by men who had made investigations of the circumstances in connection with cases where explosions have occurred while the tank in a car was being filled from a metal

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can. It was advocated strongly that the metal lip of the can should be placed in contact with some metal part of the tank on the car as a precaution against sparks jumping from the can to the tank, it being contended that the flow of the gasoline generated static electricity in one of the containers and, having no outlet, jumped in the form of a spark to the nearest metal object. Such a spark in the presence of the fumes caused by the agitation of the gasoline in the process of pouring would undoubtedly cause it to ignite.

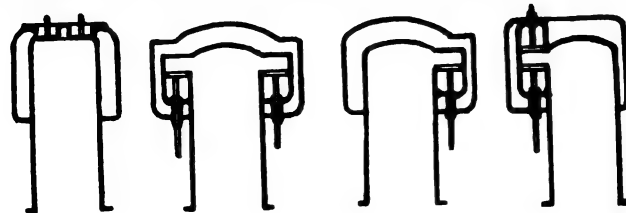
MEANING OF CYLINDER SHAPES.

(C. B. M., Bristol, Conn.)

What do manufacturers of automobiles mean when they speak of L head, T head or I head motors? I do not own or run an automobile, but lately have become interested in them. While looking over catalogues I have frequently seen reference to the expressions I mentioned before.

The terms L head, T head or I head refer to the shape of the cylinders in a motor car engine, that is cylinders which roughly conform to the letters L, T or I. The terms are also indicative of the locations of the valves in each type mentioned. In the L head type, the valves are generally all on one side, either right or left, or some times they are both in the head and on one side. In the T head engine the inlet valves are located on one side, while the exhaust valves are on the opposite side of the cylinder. In the I head the valves are located in the head of the cylinder.

An analysis of the specifications for 1917 models, covering some 200 or more models, shows that about 68 per cent. of them are provided with L head cylinders, about nine per



Shapes of Cylinders, Reading Left to Right: I Head, T Head, L Head and Special L Head with Valves in Head and Side.

cent, with T head types, about 11 per cent. with I head, while the balance, or 12 per cent., have V shaped engine blocks in which L head type cylinders predominate.

TO CUT SQUARE THREADS.

(L. E. M., New London, Conn.)

Could you advise me how to cut a square thread on a piece of one-inch round stock.

A lathe kink for cutting square threads is as follows: With an ordinary V shaped cutter form a thread of the proper lead that will be equal in depth and width to the cut of the finished square. Then follow down with the regular square tool. This saves the latter, which cuts a divided or broken chip. A roughing member should be used before cutting. If more than one piece is to be threaded, rough first and then finish, as this will keep the good tool sharp and result in a nice finish. The rougher should be speeded up and allowed to dig out the metal without regard to finish.

THE ENCLOSED BODY EQUIPMENT.

(S. E. S., Harrisburg, Penn.)

Is it necessary to alter a chassis to install an enclosed body top on a touring car?

Generally no alterations in the chassis are necessary, although it should be remembered that considerable weight has been added to the load. If the top is very heavy an extra leaf in the rear springs is a precaution often taken to insure easy riding qualities and to prevent strain. It should also be realized that the engine carries a heavier load and that fuel consumption will be increased proportionately.

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That's why we ask you to figure out where you'll land in 1919—when the wheat has been separated from the chaff—when

competition in motor car business is certain to be even keener than it is today. Your choice will not be difficult if you avoid a car with freakish designs and faddish lines. If you pass up the car that is not backed by an organization which has a clean record for integrity and business success. If you choose now a time-tried car like the Auburn.

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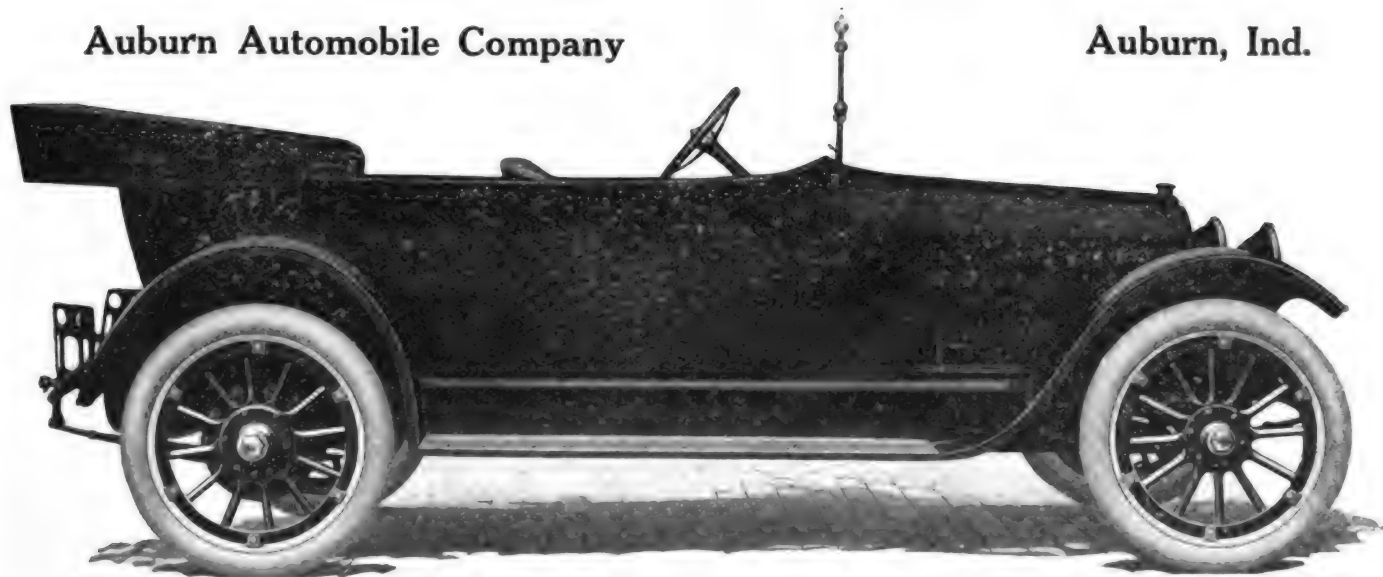
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The more you know about eights and the more you know about motor cars in general the quicker you will be to appreciate the points that are making the "Wolverine Eight" the most popular and quick selling car ever built by the Jackson Automobile Company.

We invite your attention to two important factors in this success—the Ferro-Jackson motor, and the pleasing variety of beautifully finished, well-built bodies offered in connection with the Wolverine eight chassis.

The Ferro-Jackson motor is creating an amazing interest in the Jackson car. It is the first American designed, v-type, eight cylinder motor with enclosed overhead valves without cages.

It is the first eight as well as the first v-type motor to be cast with both cylinders and upper half of crankcase in one piece.

With a bore of 3 inches and a $3\frac{1}{2}$ inch stroke it develops more power per cubic inch of piston displacement than

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It is rated at 28 h. p. and shows an excess of 50 horsepower on block test at 2800 revolutions per minute.

It is economical to a surprising degree—shows an average of 17.7 miles to the gallon of gasoline on touring tests. Some owners report better than that.

And it is an exponent of the finest type of motor smoothness, flexibility, quick acceleration. It shows surprising freedom from vibration at all speeds.

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VOL. XLII. JAN. 28, 1917. NO. 12

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Times Building, Pawtucket, R. I.

IF ANYONE Labored under the belief that the day of the high priced car was on the wane and that eventually, and soon, 99 per cent. of the makes on the market could be bought for sums as low as \$600, that person met with a startling contradiction at the New York Show. It was clearly evident that while low priced cars were as numerous as ever, the number of machines costing anywhere from \$3000 to \$6000 had increased wonderfully during 1916. In that class can be grouped the special built bodies, which were more closely examined—and more often bought—than in preceding years.

THE Cause may be attributed to the wonderful national prosperity, but many dealers and manufacturers profess their belief that it is due to the superiority of high priced cars and that buyers are becoming better acquainted with the investment value of such makes. In offering the many body refinements that have appeared in recent months, the makers have given the public a taste of luxury that is hard to disregard. Then again the desire on the part of purchasers to own a car that will reflect their individualities is another factor in advancing the price. Of course there will always be a big field for low priced cars, but it would seem that the field for higher priced ones is also expanding rapidly.

MOST People have regarded \$6000 as the ear mark of the ultimate in motor cars. This year, however, the Chicago Show is to be graced with a machine that costs \$9500 for the chassis alone. Also one will see wonderfully luxurious and comfortable special bodies and several new makes that are well above the \$3000 price class. All of which is indicative of the great prosperity that has swept over the country and is helping to swell the industry's coffers.

MOTOR Car Shows provide an excellent opportunity for the manufacturers to "feel the pulse" of the buying public, to judge whether the next year is to be dull or brisk. This is especially true of the great national shows at New York, Chicago and Boston. The first of these has come and gone, and judging from the reports from New York, and from the motor car industrial centres, 1917 is to be the most phenomenal year in the industry's history. The Chicago Show will substantiate the results at New York, while Boston will give the makers the final data on which to base their manufacturing schedules for the year.

THE Boston Show has been called the most important held in this country. In recent years it has had more exhibitors of cars and accessories than any other, and in addition to that is the only national exhibition at which commercial vehicles of all types are shown in any considerable number together with pleasure cars. From the industry's viewpoint it is the most important because more retail sales are made than at other displays. The magnitude of this year's show can be gauged from the fact that five weeks before opening day, Mechanics building had been engaged to overflowing.

IN ANSWER to those readers who inquired about the announcement on the front cover of the last issue, the Publisher refers them to pages 21 to 24 inclusive of this issue, where they will find a complete explanation of the selection of the Automobile Journal as the official magazine of the National Automobile Association and the National Highways Association. In that department, which is to be a regular feature, the management of the associations explains its origin, growth, aims and the benefits offered to members.

*Less Carbon—
More Lubrication*

EAGLEINE MOTOR OILS

Greater mileage from a given volume of Eagleine Motor Oils than any other lubricants is a constant economy. Increased engine power and superior flexibility insures satisfactory car service in any operating condition.

Positive lubrication, little, if any carbon, no sooting of plugs, means long service life of the engine with little wear and minimum upkeep and maintenance expense.

A postal request will bring you a copy of our New Auto Booklet, which gives specific information of Eagleine Motor Oils and Greases, and a lubricant chart that is not based on temperature, but on the wearing qualities or endurance of engines lubricated with Eagleine Motor Oils. This booklet is extremely valuable to motorists and is absolutely free.

Eagleine Motor Oils and Gear Grease are sold by all high class dealers or supplied direct.

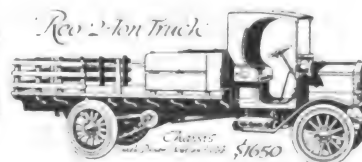
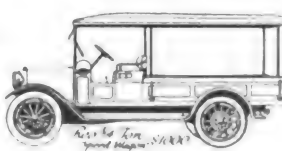
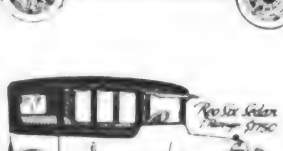
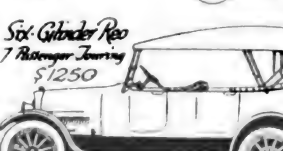
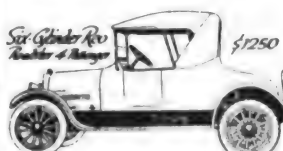
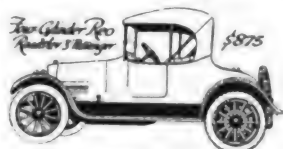
EAGLE OIL & SUPPLY CO., 44-45-46 India St., BOSTON, MASS.
Woolworth Building
New York City

1132 West 37th Street
Chicago, Ill.

(When Writing to Advertisers, Please Mention The Automobile Journal.)



When You Come to Chicago Look the Reo Line Over



All Prices are f.o.b. Lansing, Michigan

NO, WE ARE NOT looking for dealers—our present problem is to supply those we have now.

AND WE WILL SAY that, man for man, they are as clean cut, high grade a class of dealers as there are in the world.

SO THAT ISN'T THE IDEA of this advertisement.

YOU'VE BEEN A'HANKERING to look over this Reo line for a long time—when your customers weren't present to see you do it.

YES YOU HAVE—You know you have. Every automobile distributor feels that way about Reos, regardless of what line he happens to be selling now.

THERE'S A TOMORROW COMING—and you are looking forward to that. You know that it is just possible there may be a chance, some time, for you to get the Reo line for your territory.

YOU HEAR SO MUCH about the wonderful endurance, the dependability and low upkeep cost of Reos from customers, you naturally want to look and see for yourself how we Reo Folk do it.

FROM YOUR EXPERIENCE with other cars you can scarcely credit the stories users tell you about Reos—yet you know it must be true, for you hear the same tales so often.

SO HERE'S YOUR CHANCE! All the Reos will be on view at our Chicago branch show week. Come in and see them. We won't tell! And you'll be as welcome as if you were a Reo dealer now—for there's a tomorrow coming you know.

BY THE WAY, we Reo Folk have always looked rather to that tomorrow than to the immediate present—that's why we've always built Reos the way we have.

THERE ARE TEN REO models this season—four fours, four sixes and two trucks. Can't show the trucks at the Coliseum—so you'd better come to the branch and see them all—and get acquainted.

Reo Motor Car Company

Lansing, Michigan

Chicago Branch: 1218-20 Michigan Avenue

173A

"THE
GOLD STANDARD
OF VALUES"

(When Writing to Advertisers, Please Mention The Automobile Journal.)

The Survival of the Fittest

A C Spark Plugs



Unanimous Choice of 65
Leading Makers of Cars

All Plugs Were Tried Out—
The Tests Were Exhaustive

A·C· WON

At the Shows and Always, These Cars Are A C Equipped

Cadillac
Pierce-Arrow
Packard
Marmon
Hudson
Chalmers
Hupmobile
Haynes
Dort
Cole
Reo
Paige
Peerless
Saxon
Stutz
Pilot

Buick
Oakland
Oldsmobile
Jeffery
KisselKar
Premier
Knox
Jordan
Liberty
Crane-Simplex
Dodge Brothers
Stearns-Knight
McLaughlin
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Singer
Stephens

United Truck
Wilcox Trux
National
Velie
Jackson
Westcott
Pathfinder
Chandler
Chevrolet
Apperson
Davis
Daniels
Detroit
Paterson
McFarlan
Scripps-Booth

Bour-Davis
Lexington-Howard
Murray
Monroe
Signal Truck
Sandow Truck
Sterling Truck
Chase Truck
Moreland Truck
Republic Truck

G. M. C.
Diamond T
Truck
Netco Truck
Gramm-Bernstein Truck
Brockway Truck
Federal
Abbott
Gabriel Truck

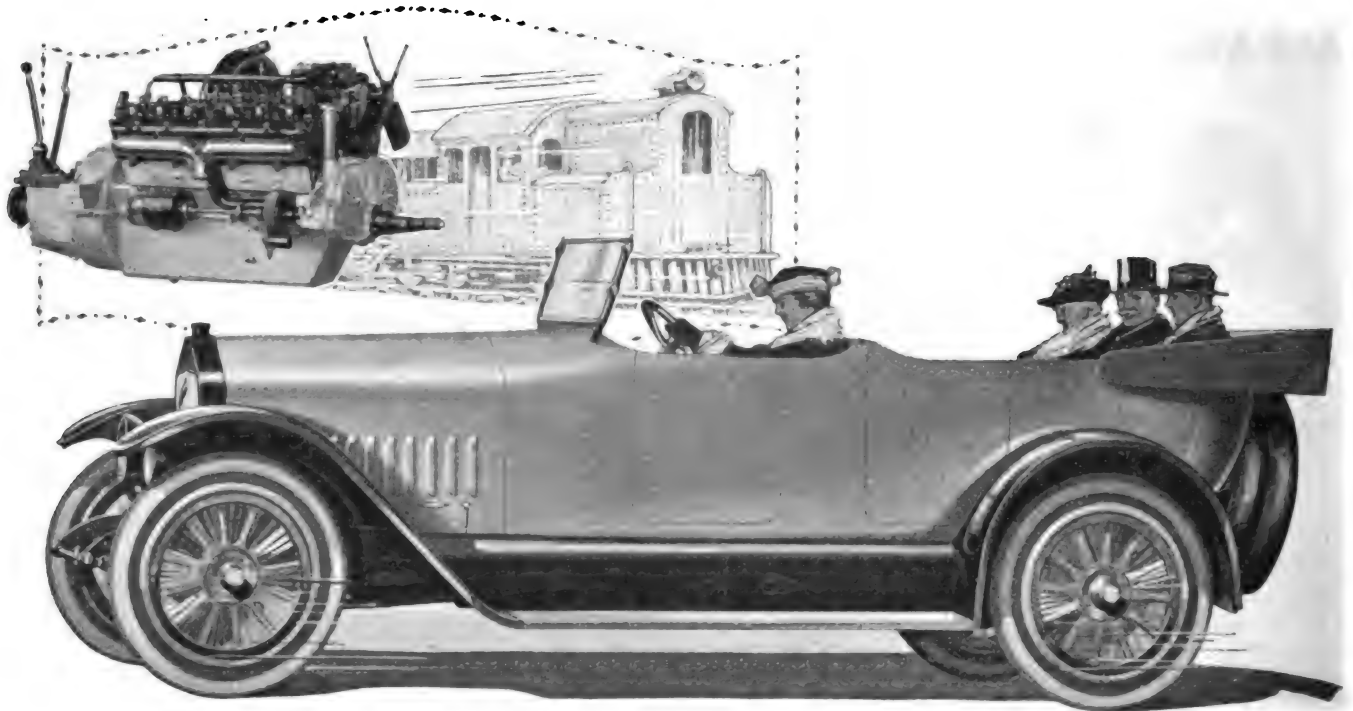
MR. DEALER:
Your customer is glad
to take your advice;
he knows YOU KNOW

Look for the "A C" Burnt Into the Porcelain

Champion Ignition Company
Flint, Michigan

The Standard Spark Plug of America





National Silent Power

Third Series of Twelves A NEW MODEL

National built motors have always been abreast, and generally ahead of the industry. When four cylinders were the proper thing, National built the world's Champion Fours. When sixes came into vogue, it was National that built the first American Sixes and National Sixes of today are the highest development of that type. National was a pioneer in the latest type motor—the Twelve Cylinder.

National Twelve Cylinder cars are today in operation in every state in the Union and in eleven Foreign countries. Owners everywhere testify to the success of the Twelve.

The same corps of engineers who have produced previous successes, have within the last year, concentrated on improvements for this third National Twelve.

NEW FEATURES

Removable cylinder heads to facilitate cleaning and inspecting.

Increased size of cylinder with corresponding increase in power.

Balanced crankshaft—another power increasing improvement.

Heated intake manifold to handle effectively the low grade fuel.

Larger main bearings reduce the vibration in a practically vibrationless motor.

Valves on outside of V continued together with new design valve lifters that make National Twelves most accessible of all V motors.

Independent electrical units—Delco for Ignition and separate, independent Starting and Lighting units.

¶ This new Twelve is the last word in multi-cylinder efforts to achieve perfection.

¶ From low to high speed—and at every stage in between—there is the same *high pressure* of power, even, supple and subject to your perfect control.

¶ In short, it is a marvelous motor—not to be appreciated until driven.

¶ To be the National dealer is not only to have the best motor to demonstrate, but to have the best of *everything* to offer customers.

HIGHWAY TWELVE \$2150

HIGHWAY SIX \$1750



\$2150

AMERICAS BEST LOOKING CARS

National Motor Car & Vehicle Corp., Indianapolis

Seventeenth Successful Year



\$1750

(When Writing to Advertisers, Please Mention The Automobile Journal.)

THE Automobile Journal

VOL. XLII.

JANUARY 25, 1917.

NO. 12.



Historic Jackson Square and St. Louis Cathedral, Where Many Stirring Events in Louisiana History Have Been Enacted.

New Orleans and the World-Famous Mardi Gras

Teeming with Centuries of Legend and Romance, This Louisiana Metropolis Standing Near the Gulf of Mexico, Is a Mecca for Tourists from All Parts of the World, Especially While the World-Famous Mardi Gras Is In Progress

TO EVERY traveler in the world the words Mardi Gras are associated with the city of New Orleans and the great carnival that is held annually in the Crescent City during several days prior to the opening of the Lenten season.

Mardi Gras 100 Years Old.

The Mardi Gras has each year grown in splendor and significance since it was inaugurated 100 years ago by a group of students upon their return from France after completing their education there. It is now conceded the world over to exceed in all respects the fetes, carnivals and celebrations that are held in the other big countries.

Each year thousands of tourists and pleasure seekers visit New Orleans during the carnival and help to carry on the merry festivities incidental to the grand pageants that take the form of street processions. The floats making up these

processions and the costumes of the participants attain the ultimate in bizarre designing.

The fantastic is blended with the beautiful in motley color, while the routes of the march are gaudily decorated, banners, fixed pieces, flags and other ornamental devices adorning the public buildings throughout the city. A carnival atmosphere prevails on every side and the most blasé individual could not remain in the city during Mardi Gras without being impelled to recognize the great spirit of frivolity and pleasure that prevades the community.

Each Year Sees Big Growth.

Little did the small group of French students who started the custom with a masquerade a century ago upon their return from Paris, realize that they had set in motion a Bachanalian spirit that would roll on through generations in gathering volume.

Originally the Mardi Gras was a festival of short duration, but it constantly grew in popularity and was extended over a longer period. In 1857 the main feature took the form of pageants with scenic floats. This idea was developed and now there are several separate processions and the merry making lasts nearly a week.

Grand Finale a Huge Spectacle.

Starting with a procession on the Thursday preceding Shrove Tuesday, which is the day preceding Ash Wednesday, the celebration, beginning this year on Feb. 22, includes a series of parades, masquerades, balls and other festivities, culminating in a grand finale on Mardi Gras, that assumes the form of a great masquerade in which thousands participate in all conceivable types and styles of costumes.

Here and there may be gay cavaliers, seeming to have stepped from the court



A Typical Garden Courtyard of an Old French Home in the Latin Quarter, Which Now Forms the Business Section of New Orleans.

of Louis XIV and escorting Spanish princesses or Honolulu queens. Cowboys, Norsemen and characters typical of every country in the world mingle in the throng, while many may be seen in Mephistophelian attire, representing the underworld. All these people, seemingly denizens of the fairy world, are subjects of gay Rex, who rules over the "Kingdom of New Orleans" with undisputed sway throughout the period of Mardi Gras.

Receiving Mardi Gras King.

The ceremony of receiving the King is another beautiful pantomime that takes place on Monday afternoon. While bands play and the crowds join in song, the royal barge docks and Rex steps on to his domains for a reign of hilarity and pleasure. Officials present him with the keys of the city. In the evening the Krewe of Porteus have a ball and tableaux, which is preceded by a gorgeous parade of floats beautifully decorated and brilliantly illuminated.

On Tuesday, at noon, the streets are prepared for the grand parade, which is led by the King in his royal chariot, heading a procession made up of many floats, typifying national scenes, events and mythological happenings. In the evening, when the Rex ball is held as a fitting climax to the fast and furious round of festivities over the several days, the Mystic Krewe of Comus enliven the night with another parade of floats and a ball and tableaux at the Old French Opera House.

Incessant Round of Gaiety.

From the opening festivities, which begin on Thursday of the previous week with a street parade conducted under the Knights of Momus and followed by a ball and tableaux in the evening, until sunrise on Ash Wednesday, the incessant round of gaiety throughout the city is of a character that can be witnessed no where else in the world. The magnitude and magnificence of the pageants and processions is beyond conception—without one has first witnessed one of these carnivals of pleasure in which the Bacchanalian spirit predominates among the old and young, staid and frivolous.

It is almost needless to mention that a

community which fosters such an unusual annual custom has a history teeming with romance and events that stand out singularly as being associated alone with a city that was founded by the pleasure loving French and in which these people have played a leading part during the two centuries of its existence.

New Orleans is the southern point of entry to the great middle west and at the mouth of the Mississippi, "Father of Waters." It is the largest port on the Gulf of Mexico around which lies the islands and countries that figured in the early adventures of the great explorers who

discovered America and later explored and exploited its vast riches.

Steamers pass from this port out through the Mississippi delta, bound for all the ports in the world of any consequence, and this intercommunication with many races of many tongues has left its traces upon the people of the city and its institutions, making it probably the most cosmopolitan metropolis in America.

New Orleans a Modern City.

New Orleans, however, has not been retarded in the march of progress for these reasons, but has grown apace with the rest of the large cities of the country. Its most modern type of public institutions and buildings make it architecturally the equal of the more recently founded centres in America.

Its greatest charm, on the other hand, accrues from the presence of the many old public buildings, religious edifices and structures. They are associated with many of the historic incidents that loom large in the history of the United



The Stately Grecian Pavilion in the City Park, Which is One of the Finest Municipal Reservations in the South.



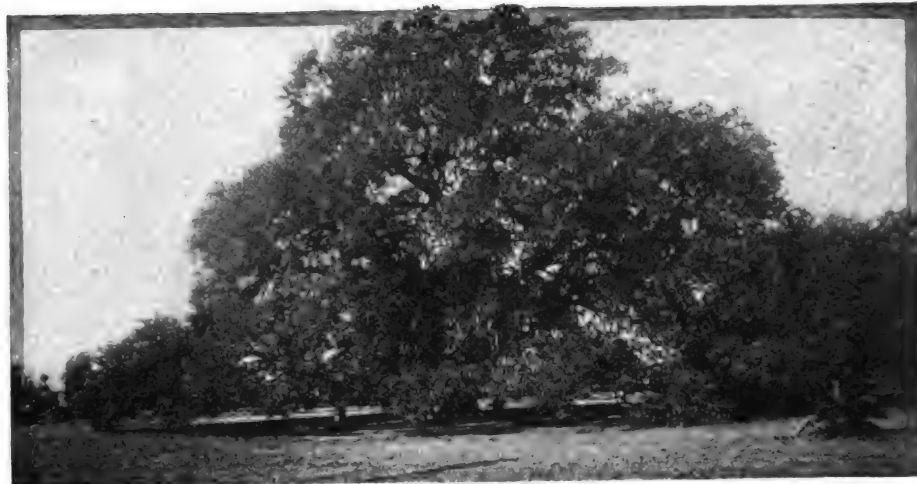
Stately Palms Align Many of the Residential Thoroughfares

States and the adventuresome period when the European nations were contesting with one another for proprietorship of the American continent.

Monuments and land marks are still in evidence, giving mute testimony to the time when the French flag first waved over the settlement; when the emblem of the Spanish flew in place of the tri-color and again when the tri-color once more took its place. Many of the present buildings were standing when the Star Spangled banner was flung to the breezes to be hauled down for a brief period while the Confederate flag topped the staff, indicating the allegiance of the citizens to the southern cause.

Life in the Early Days.

Life in the early city was one long century of uninterrupted troubles and hardships. The men sent from Europe to govern the settlement proved domineering and merciless autocrats, inflicting tortures upon people who earned the displeasure of the government. Plagues, pests and other death dealing agents



Under This Oak in City Park Young Blades of the Old City Fought Duels with Rapiers and Pistols Just at the Break of Day.

held sway for long periods, and in 1788 a great conflagration practically wiped out the city.

New Orleans has several distinct districts for which it is renowned. Two of these are of particular interest, the garden district and the French quarter. The garden district is where most of the prominent citizens of the present and past have built their palatial homes amid surroundings such as can be found in no other city in the country. For artistic architecture some of these dwellings, setting as they do among veritable gardens of blooming foliage, represent the acme of the home builder's art. They are

fairly abodes the year around, as all the flowers that bloom to grace the northern summer are in full efflorescence throughout the year. The effect of beauty throughout this neighborhood is heightened by the magnificent boulevards and wonderful parks and public gardens.

The Famous French Quarter.

The French quarter is one of the most picturesque and historic spots in America. Here are located many points of interest with which are associated happenings that have figured in the country's history. To pick out each place and spot and adequately describe its history would require volumes if justice was to be done their importance. It suffices to say that in this environment great writers lived to draw material for the romances that they were to weave about the early happenings in America and the United States. They found an atmosphere in the French quarter that teemed with interest for one in search of the romantic. Buildings 200 years old seem to echo of the times when they were the headquarters of bold pirates who set forth for the seven seas to prey upon the world's merchantmen.

Here and there is heard the name of a dish or drink with which the habitués of the New York, Paris and London clubs are familiar, and further investigation into this seeming coincidence reveals the fact that the concoctions had their origin in the quarter and were named for one of its famous places where the residents still assemble to discuss topics of the day.

Progressiveness Predominates.

New Orleans has risen to the spirit of the era with greater enthusiasm and progressiveness than almost any other city in the country. The officials of Louisiana and leading citizens of the city of New Orleans are ardent good roads enthusiasts and have been instrumental in securing wonderful improvements in the systems of highways that lead into the city from all over the country, North, East and West.

These roads, which lead to Jacksonville, Fla., on the east, Los Angeles and the other Pacific ports on the west, and



One of Many Landmarks—Here the British General Packenham Made His Headquarters in 1814.



New Orleans, Suggesting Its Soft Sub-Tropical Climate.



Modern New Orleans—The Beautiful Country Club Standing in the Uptown Residential Section of the City, the Resort of All Ages of New Orleans Society.

New York, Chicago and Winnipeg on the north, are not less than 14 feet wide and are hard surfaced with rock, gravel and other materials. The enthusiasm with which this city took up the good roads movement is shown in the fact that 13 months after the Jefferson Highway Association was formed in New Orleans over 1000 miles of the 2000 miles route was provided for as a paved highway.

Millions of dollars have been expended on port improvements in the city, making it not only the second port in the United States in volume of commerce shipped, but the first in equipment. Many millions have also been laid out in

giving the city the finest water supply plant in the country, as well as excellent sewerage and drainage stations. To attract capital, laws were passed with the view to interest and not antagonize investments in the state.

Good Roads and New Orleans.

With the big port improvements there was a large increase in both river and railroad traffic into the city, leaving but one thing to be taken care of in the comprehensive plan for a greater, better and richer city. To round out the scheme, an extensive highway system, to attract overland traffic and commerce into the

city, was mapped out and is being carried forward with dispatch and completeness.

With all these advantages for the developing and maintenance of commerce and trade and civic improvements and virtues that attract the business man and home seeker, the city is looking forward to a growth that will ultimately mean the realization of the predictions of Father Charlevoix and Thomas Jefferson. The former in the early 18th century prophesied that New Orleans would grow into a magnificent metropolis and the latter saw it in the future as a modern Babylon.

Organizing To Standardize Laws in New England

A. H. SOWERS, one of the leading members of the Bay State Automobile Association, has addressed a letter to George W. McNear, president of the Massachusetts State Automobile Association, for the purpose of starting a movement toward establishing better relations between motorists and motoring organizations in New England, making the proposal that a vast mass meeting be held somewhere in Boston on some day of the week in which the Boston Automobile Show is in progress.

The ideas expressed by Mr. Sowers in his letter are as follows:

"As the Federal government has now decided that the various states have a right to make motor laws of practically any sort, it is evident that one good plan would be to start a movement for reciprocal relations here in New England, where the territory is small and a motorist travels into all the states.

"Rhode Island has a barrier against Massachusetts motorists on one side and New Hampshire on the other, and we (Massachusetts) bar residents of both after 10 days stay. There are no uniform laws on the entire motor subject. There should be. And the only way to bring this about is through closer relationship between the motor bodies.

"The Boston show will bring to the city many New England motorists. We could call a convention for some afternoon, perhaps, but a dinner some evening would be better. There is a big social event held each year at show time by the clubs and dealers jointly.

"This year we should invite as our

guests representatives of the motor bodies in Maine, New Hampshire, Vermont, Rhode Island and Connecticut. To our members the visitors could be introduced and there could be established a friendly feeling right away.

"Then when motor legislation was under consideration in future in any one of the six states we should all help each other by trying to see that any laws about to be passed were such that could be made uniform in all the states. If we had uniformity in New England the system would spread. And when men gather at a dinner where they break bread they cement friendship and come to know each other better.

"Massachusetts motorists when visiting other states would feel like dropping in on men representing other organizations, and that strange feeling would disappear. It seems a most opportune time to start the movement, and I shall be glad to do anything I can when touring New England to spread the gospel of closer friendship."

PREDICTS SWEEPING CHANGE IN ENGINE DESIGN.

Prof. Walter T. Fishleigh, associate professor of automobile engineering at the University of Michigan, in a paper presented at the winter meeting of the S. A. E. in New York City during the early part of the month, predicts that sweeping changes are necessary in the design of gasoline engines and if improvements are not gained in this way the type of engine used must be changed altogether.

In his paper Prof. Fishleigh gave the results of his exhaustive tests into the efficiency of the gasoline engine. He said that his tests showed that only 10 cents worth of power is actually developed from \$1 worth of gasoline in the modern engines at the flywheel and delivered to the transmission box.

Speaking of these tests, he said: "The more we study characteristics of the present type of engine, and the more we inquire into the reason for its manufacturing status quo, the more we are convinced that sweeping improvements in design must come, or the type be changed altogether."

The remaining 90 cents worth of fuel, he said, was developed into power that was dissipated in the form of heat losses through the exhaust, in cooling water and air and in friction.

ROAD CONVENTION TO BE HELD IN BOSTON.

An attendance of from 3000 to 4000 is expected at the American Road Builders' Association convention to be held in Boston from Feb. 5 to 9, at the Copley Plaza Hotel and the Mechanics' building.

The eighth National Good Roads show will be held in the Mechanics' building in connection with the convention, under the auspices of the Good Roads Congress. Additional interest in the convention attached from the fact that the president of the American Road Builders' Association this year is Arthur W. Dean, chief engineer of the Massachusetts Highway Commission.

Chicago Show Opens; Record Breaking Crowds.

17th Annual Exhibition of Pleasure Automobiles and Accessories Is Housed in Coliseum and Armory and Consists of 96 Car and 165 Accessory Exhibitors. Striking Decorative Scheme Worked Out at Cost of Approximately \$50,000.

THE 17th national automobile show opened at Chicago under exceptionally auspicious conditions, as it is the exposition which draws upon the great Central West, West and Southwest, where reside the majority of the farmers who produced over \$10,000,000,000 worth of products during the past year.

As a dealer's show, where big contracts are negotiated for cars and accessories, the exhibition at Chicago has for some years outranked the New York show, but this year it outclasses any pleasure car exhibition ever held in the world in point of number and value of exhibits.

\$50,000 for Decorations.

The big Coliseum and First Regimental Armory house over 400 cars of the very latest models, and over 400 tons of accessories and parts displayed in a setting that cost nearly \$50,000 to produce. The array of cars includes the product of 96 different manufacturers and over 165 accessory makers and distributors are showing their wares.

The decorative scheme is a combination of the medieval and early English renaissance worked up to represent the interior of an ancient English castle, with mural panels of scenic art glass in amber, green, old rose and black. Work on the decorations has been going on for nearly a year and no pains or expense were spared to produce a setting that would eclipse anything that had ever been used before as a setting for the products of a great industry.

With the year just closed going on record as the most prosperous ever experienced in the automobile industry, and the year being the first in which sales totaled the enormous sum of \$1,000,000,000, it is expected that new records for volume of business transacted among manufacturers and distributors will be established at Chicago. Plans were made for the attendance of nearly 5000 dealers at the show and most of them come from the sections where the majority of cars are sold in the United States. A delegation of dealers from Texas and the Southwest arrived in Chicago on a special train.

Farmers Are Big Buyers.

Farmers bought automobiles last year to an extent never before known and the dealers who handled this business have enjoyed the greatest prosperity in their experience, all of which contributes to the conviction that when the show closes the automobile industry will have gained additional momentum to carry it beyond the many records attained last year.

SIX-CYLINDER CARS.

Auburn	Sun	Apperson
American	Abbott	Buick
Columbia	Ben Hur	Crow-Elkhart
Chandler	Cramers	Davis
Elgin	Detroit	Franklin
Fageol	Empire	Glide
Hudson	Grant	Haynes
Jordan	Jeffery	Jackson
Lozier	Kissel	Hollier
Mitchell	Lexington	Liberty
Moon	Marmon	McFarlan
Oakland	National	Pierce-Arrow
Palge	Owen	Premier
Roamer	Pathfinder	Studebaker
Reo	Overland	Westcott
	Saxon	

FOUR-CYLINDER CARS.

Buick	Allen	Case
Drexel	Dort	Dodge
Empire	Dixie	Hupmobile
Fiat	Elcar	Inter-State
Ingram	Harroun	Mercur
Lozier	Jeffery	Moline
Maxwell	Monroe	Pullman
Overland	Oldsmobile	Regal
Reo	Princess	Stutz
Saxon	Scripps-Booth	Woods
Briscoe		Stearns

EIGHT-CYLINDER MODELS.

Cadillac	Jackson	Oakland
Cole	Chevrolet	Cunningham
King	Apperson	Hollier
Peerless	Majestic	Oldsmobile
Stearns	Regal	Standard
	Scripps-Booth	

12-CYLINDER MODELS.

Austin	Enger	Hal
Haynes	National	Packard
	Pathfinder	

The car exhibition includes 88 of the gasoline type, four electrics and one combination gasoline-electric. The above table gives the cars in the classes divided as to the number of cylinders.

\$9500 for Chassis.

The range of prices in the cars shown is the widest ever reached at any automobile exhibition, graduating from \$395 for a touring car model to \$9500 for a stripped chassis. The latter is the price of the Fageol, which is being shown at Chicago for the first time in public. Many novel features are incorporated in its design, including a six-cylinder Hall-Scott 150 horsepower aeroplane motor. A special body is mounted on the chassis, representing the last word in coach design and finish. The makers of this car guarantee a speed of 100 miles an hour.

Three other cars will also make their debut at the show, the Glide, Woods Dual Power car and the Pan American.

In addition to the main exhibit at the Coliseum, Armory and other auxiliary shows during the week, the Chicago salon will hold forth in the Elizabethan

room of the Congress hotel, where a number of the cars that were exhibited at the New York Salon will be displayed.

W. E. METZGER PRESIDENT DETROIT AUTO CLUB.

At the annual election of the Detroit Automobile Club, William E. Metzger, head of the Auto Parts Mfg. Co., was elected president. The other officers elected are: Martin L. Pulcher, vice president and general manager of the Federal Motor Truck Co., vice president; Edward N. Hines, chairman of the Board of County Road Commissioners, second vice president; Sidney D. Walton, consulting engineer, third vice president; W. B. Bachmann, secretary, and J. Lee Barrett, treasurer.

The following directors were elected: Martin L. Pulcher, W. A. Brush, manager of Brush Engineering Assn.; R. K. Davis, sales manager Penn Spring Works; E. W. Lewis, vice president Timken-Detroit Axle Co.; A. O. Dunk, Sidney D. Walton, W. E. Metzger, M. C. DeWitt, Edward N. Hines.

HARROUN MOTOR TEST SHOWS 43 HORSEPOWER.

One of the new compact Harroun engines, rated at 16 horsepower by the S. A. E. formula, developed 43.1 horsepower on a dynamometer at the laboratories of the Remy Electric Co.

The engine, which was designed by Ray Harroun, and which is the same as used in the Harroun car, has a 3¼-inch bore and 5¼-inch stroke, with a total piston displacement of 174 cubic inches for its four cylinders. Under test it developed 20 horsepower at 900 revolutions per minute, 30 horsepower at 1400 revolutions, 35 horsepower at 1650 and 43.1 horsepower at 2400 revolutions per minute. The power remained constantly above 40 horsepower from 1950 to 3100 revolutions, representing a speed of from 45 to 70 miles an hour.

THE POWER OF A GALLON OF GASOLINE.

The average person generally rates the power of a gallon of gasoline by the distance that it will propel an automobile, but the same energy if diverted to other purposes, we are told, will milk 300 cows, bale four tons of hay, mix 35 cubic yards of cement, plow three-fifths of an acre of ground, or will generate enough electricity to light a farm house for 30 hours.

Philadelphia Show Big Success

100,000 People Viewed the 16th Annual Exhibition of Motor Cars and Accessories

MORE than 100,000 persons of every degree of wealth and age visited the 16th annual exhibition of motor cars in Philadelphia thereby breaking all existing records for that city. Two outstanding factors were responsible for the record, the fact that prosperity is rampant in that section, as everywhere else, and that the display was held in the largest single story building under one roof in the Quaker city, the Commercial Museums building.

The increase over last year's show can be gauged by the fact that the Commercial Museums building has 75,000 square feet of floor space as compared with the 50,000 square feet available in 1916, and that this space was thronged by visitors and cars and accessories. Capacity crowds were the rule every day of the week, from Jan. 12 to the 20th.

In magnitude and importance the Philadelphia show approaches the New York and Chicago exhibitions. There were 117 exhibitors, 66 of which displayed cars in one form or another and 51 showed accessories and equipment. Approximately 280 cars were on exhibition, there being about an equal number of closed and touring models. Roadsters totaled about 60, and there were more than 30 stripped chassis shown.

The Philadelphia Automobile Trade Association, which staged the show, faced the problem of providing room for the overwhelming number of applications

for space, and met the conditions only after prodigious labor. Before the work was done the association had expended about \$40,000, half of which went toward installing an adequate heating and lighting system in the Commercial Museums building.

About \$9000 of the total amount was spent for decorations and the result showed that the money was well expended. Philip S. Tyre designed and executed the decorations, he borrowing from the Orient, mainly Japan, for his ideas. So well did he do his work that it was not long before visitors and exhibitors were calling the main aisle the "Peacock Alley." The whole display space was decorated with multicolored stenciled designs and freizes and graceful Oriental pillars.

As regards the cars shown, the Philadelphia exhibition might be called a replica of the New York show, in that the majority of models shown in Grand Central Palace were also displayed in the Commercial Museums building.

KNIGHT SPECIAL WITH MANY NEW FEATURES.

Watson and Stoeckle, 351 West Fifty-seventh street, New York City, have developed a car which will be called a Knight special, with many new features. A Moline Knight 4x6 four-cylinder engine is used and the drive is through an Entz magnetic installation and worm and gear with leather universals. The rear cantilever springs are 61 inches in length. The chassis is to be sold at \$4000 and bodies are custom built.

FAGEOL CHASSIS SELLS FOR \$9500 COMPLETE.

The highest priced and highest powered car at the Chicago show, which opened on the 27th, is the Fageol, made by the Fageol Motors Co., Oakland, Cal. It has many unusual features, including a 125-150 horsepower Hall-Scott six-cylinder aviation motor. The chassis sells for \$9500 and has a guaranteed speed of 100 miles per hour. A special custom body, built by C. P. Kimball & Co., is fitted to the chassis.

THE SOUTHWEST RAPIDLY ABSORBING MOTOR CARS.

A recent compilation of statistics covering the registration of automobiles in Texas, Oklahoma, Arkansas, Louisiana and New Mexico, shows a gain in the eight months ending Dec. 1 of 101,071, or 55 per cent. The total registration in the three states on Dec. 1 was 282,762.

The Southwest has enjoyed tremendous prosperity during the past year,

which has manifested itself in large purchases of automobiles, tractors and other products. Purchases of automobiles have been especially heavy, all the states in that section of the country having recorded gains in registrations ranging from 48 to nearly 100 per cent.

During the period from March 1, 1916, to Dec. 1, 1916, the registrations in Oklahoma increased from 26,700 to 50,849, a gain of 24,149, or nearly 100 per cent. In Texas in the same period registrations increased from 129,743 to 191,375, a gain of 61,632. In the other three Southwestern states the registration figures are as follows:

	Dec. 1-16	March 1-16	Gain
Arkansas	15,423	8,448	6,975
Louisiana	16,887	11,300	5,587
New Mexico....	8,228	5,500	2,728

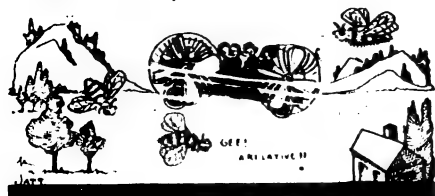
According to the 1910 Federal census, Texas had 3,204,911 white inhabitants. The state has no so-called state license. An automobile is registered by the payment of 50 cents to the county and this license is perpetual.

An analysis of the statistics, which were compiled by the Holland Pub. Co., shows that the largest increase in the registration figures during the period named was recorded in the counties that are largely given over to agricultural pursuits. This has also been true throughout the Southwest, which has developed as a large market for both motor cars and accessories.

Dr. H. R. Welch is secretary of an association that is planning a \$300,000 automobile speedway north of Beck's hot springs, near Salt Lake City, Utah.

A BUMBLE-BEE CAR.

Water, air or rough roads have no terrors for the aero-motor, the conception of a Detroit inventor, William A. Sharpe, who, rumor has it, got his inspiration by studying a bumble bee. It is claimed that the weird looking vehicle can speed along a road like an automobile, or by merely pushing a button can soar into the air a la aeroplane, or will ride the waves of the ocean as gracefully as a motor boat. With runners attached the machine can be sent over a frozen lake at the rate of 150 miles an hour. The aero-motor has four flywheels, to each of which is attached a giant fan or propeller of four strong blades, which operate independently and are said to develop a lifting force of 800 pounds each.



AN INVENTOR'S TROUBLES.

Enthusiasm has often gotten a person into trouble. But it is unusual for an inventor to become so enthusiastic over an invention intended to keep down the pace of an automobile as to be arrested for overspeeding. A New York City dealer in motor cars had conceived a means of automatically slowing down a car to 16 miles an hour. He jumped into his machine, which, sad to relate, was not equipped with the device, and speeded to tell his closest friend. In the crowded traffic of Fifth avenue he attained a speed of 27 miles an hour, so the traffic officer related to the court, and was haled to the nearest police station and fined \$100. It was the dealer's third offense against the speed statutes.



The Lincoln Highway and the Wm. Penn Highway



The Approach to Bedford,
Penn.



A Smooth Turn on Ray's Hill, Bedford Co.

By Phillip P. Sharples

THE Pennsylvania State Highway Commission has taken cognizance of the increasing East and West travel across the state and have concentrated their efforts at improvements on two main thoroughfares, the Lincoln Highway and the William Penn Highway, and their "feeders."

Lincoln Highway Route.

The Lincoln Highway is the most popular route and takes a southern course through the rich farm lands of Chester and Lancaster counties, via Columbia, York, Gettysburg (with its battlefield), Chambersburg and Bedford. Approaching Lancaster, the section from Philadelphia to Paoli, the section from Williamstown to Lancaster and various sections from Lancaster to New Oxford, although nominally a part of the state highway system, are not as yet released to free travel, but are held by the old pike companies, which have built and maintained the roads with varying success from early times in Pennsylvania road history. Just at present, with increase in auto traffic, times are prosper-

A Pennsylvania Beauty Spot, Near Franktown.

ous and the pike companies value their holdings high.

Like individuals, the companies have widely differing standards of ideal. Some, like the companies controlling the road from Lancaster to Columbia, Wrightsville to York, York to Oxford, are surfacing with modern road materials like tarvia, to make the road pleasant to the traveling public. Others are neglecting their holdings with the idea perhaps that the

state, the eventual owner of the roads, will pay no more for a worn out article than for one in first class condition.

Be that as it may, the autolst pays the

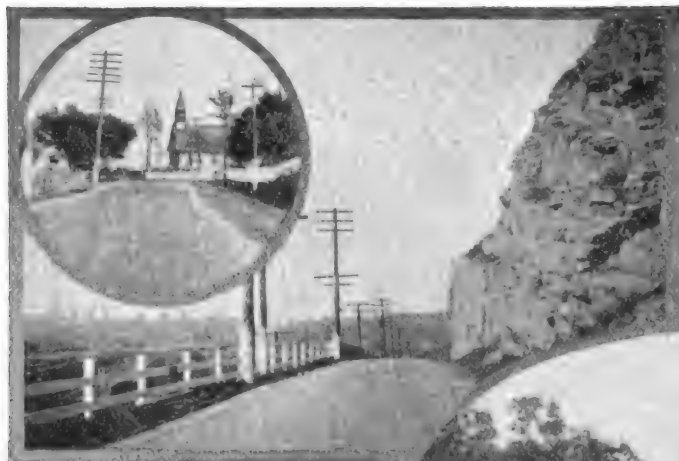
toll half cheerfully on the well kept road, but consigns to perdition all pike companies which offer him nothing but a right of way in return for his pence. The state is now setting a high standard for macadam road maintenance and, unless the pike companies conform, the auto public, which is fast becoming all the public, will soon demand condemnation proceedings against the ancient pikes.

A Beautiful Tour.

From Chambersburg west the road is under state control, except through incorporated boroughs. The scenery becomes grander and the first mountain at Fort Loudan gives the traveller a taste of what is to come. Like the old National Pike in Maryland, the road crosses ridge after ridge, making the ride one long to be remembered. Scattered in between are interesting and historic vil-



A Picturesque Spot in Lower Breezewood, Bedford Co.



Fairview, Near Reading (Circle).



In Juniata Valley (Oval).



Scenes Along Pennsylvania's Excellent Highways: Entrance to Hollidaysburg, at Top Left; Picturesque West Reading, at Top Right; the Road Near Collegeville, Which Formerly Was Very Rough Road, at Lower Left; the Road at the Summit of the Alleghenies in Somerset Co., at Lower Right.

lages like McConnellsburg, Bedford, Stoyestown, Jennerstown, Ligonier and Greensburg, each with its own individual setting, but nevertheless identified with the characteristics of a southern Pennsylvania village.

The state road is macadam for long stretches, treated and maintained with bituminous surface treatments. Where the roads, as through Bedford county, are in good condition, the state has specified bituminous materials of a tar base like Tarvia-B. The material is applied cold and the state requires that powerful auto sprayers, giving a high velocity to the spraying jet, should be used in its application. The amount used per square yard is one-fourth to one-half gallon, depending on the condition of the road. The Tarvia-B is covered after spraying with clean pea gravel, pea stone or sand, depending on the available local material and also to some extent on the grade. On steep grades it is important to choose a coarse, hard material for a cover, in order to make the surface the least slippery possible for horse traffic. For auto traffic even fine

covering does not present a slippery surface, contrasting strongly in this respect with the oils and oil asphalts which are invariably slippery for automobiles, when wet.

Patrol System.

The roads once treated are maintained by the patrol system, using a tar cold patching material. The Pennsylvania patrol system is becoming a model of its kind and the marked improvement in the roads due to its adoption make the autoist feel that it is a great step ahead.

Each patrolman is furnished with

stone, tar cold patch material and with tools. It is his job to patrol a section of the road, correct all minor defects in drainage, keep the culverts clear and to patch carefully any breaks in the bituminous coating. The men are instructed in the art of patching by the division engineer and the constant patrol of the roads by the engineers at unexpected times is the heart of the system. Each patrolman displays a flag showing his division number and indicating to the passers by as well as to an engineer that he is an honored road official. The men take pride in their work and each wishes his own section to be the best. A healthy rivalry is bred which keeps the men at work in spite of the absence of direct oversight. On the Lincoln Highway and on the William Penn Highway not one is seen loafing on the job.

The patrol system preserves the bituminous coat intact through the season and keeps the road at all times in the best possible condition. At the same time it has, where faithfully carried out, proved to be the cheapest system in the end. Extensive and ex-



Grand View a Favorite Stopping Place Between Bucktown and Schellsburg in Bedford County.



pensive repairs are obviated and the cost of the patrolmen saved many times over in the ultimate reckoning.

The William Penn Highway takes a more northerly course than the Lincoln Highway. The State Highway Department is rapidly building in the missing links and even now in pleasant weather

the unimproved parts are passable with pleasure.

The macadam surfaces on the William Penn Highway have, like those on the Lincoln Highway, received applications of refined tar. No prettier stretch either scenically or from the road viewpoint exists anywhere than the road crossing the summit at Cresson and winding down through the beautiful valley of the Juniata to Hollidaysburg.

Another beautiful stretch of road is near Frankstown, where the road follows along the Frankstown branch with many interesting pictures unfolding at every turn.

From Huntingdon the river is not completed, but the upper road through Allensville to Redsville is bituminous treated. Down the Susquehanna from Liverpool to Harrisburg the road is good but not surface treated.

East of Harrisburg the pikes begin again with frequent tolls and the surfaces are indifferent till the state work

begins again at West Reading, continued at East Reading after the passage of the city streets.

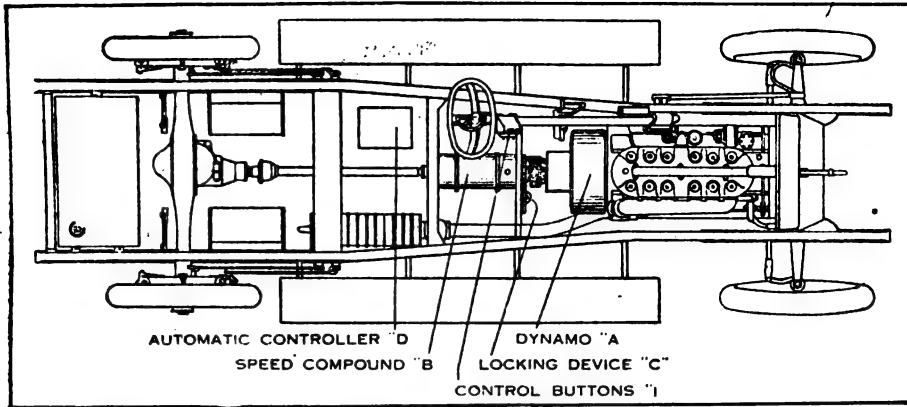
The trip is only given in hurried outline, but to appreciate the good work done this year on the Pennsylvania state highways, the motorist should make the tour in person.



Going Westward Into Cresson, in the Mountain Region.



The Highway Beside the Swift Running Juniata River.



Layout of the New McFarlan Power Plant and Transmission.

McFarlan's New Transmission

1917 Model Employs the Vesta Centrifugal-Electrical Transmission As the Standard

ONE of the features of the display of new cars at the New York Show was the first announcement and exhibition by the McFarlan Motor Co., Connersville, Ind., of the new "full magnetic" McFarlan Six, which for 1917 is equipped with the Vesta centrifugal-electric transmission. It was the only new car so equipped for next year, and created quite a sensation among spectators and dealers.

Through the use of this system the conventional equipment of flywheel, friction clutch, transmission gears, starting motor, lighting generator and all levers are done away with, the functions performed by these parts being taken care of by the dynamo, which gives invariable speeds and acts as an automatic controller.

The power is transmitted through the elastic pull exerted by the armature on

the end of the crankshaft revolving about the field of the dynamo on the shaft running into the transmission box. As there is no direct contact between the driving and driven members, the acceleration is gradual and without hitch or strain.

The speed compound, which corresponds to the transmission set in the conventional type of car, provides one low gear ratio for forward drive and a low or high gear ratio for reverse. These gears are always in mesh, but do not slide, and, except when in low or reverse, do not rotate on each other. When in the running position they all rotate freely around the propeller shaft and act as additional fly-wheel weight.

A locking device is fitted to the propeller shaft to prevent the car from running backwards when the dynamo is acting as a motor to start the engine. An automatic controller is used to connect the batteries in series with the dynamo armature to crank the engine and remains parallel when the car is running.

Excepting the service and emergency brakes, which are operated by pedals, the control is centred in the steering wheel and control buttons, which are placed near the top of the steering column underneath the wheel. To start the car, the ignition key is inserted and the button marked "start" is pushed in. This operation also closes a switch, which throws the pawl of the locking device into the ratchet wheel and prevents the car from going backward, the power of the dynamo acting as a motor being used to start the engine.

After the engine has been tested by throwing on the gas and pressing the ac-

celerator, the operator presses the button marked "run." When the engine is accelerated to its proper speed with this button pressed in the car goes forward on high. There is a separate button for reverse speed.

If the load on the car is greater than the magnetic pull can overcome, the car slows down and stops, but the engine continues running and the dynamo is charging the batteries. A button marked "low" is then pressed in and the car starts up again. As soon as it has gained sufficient momentum the "low" button is released and the transmission is in high or direct drive.

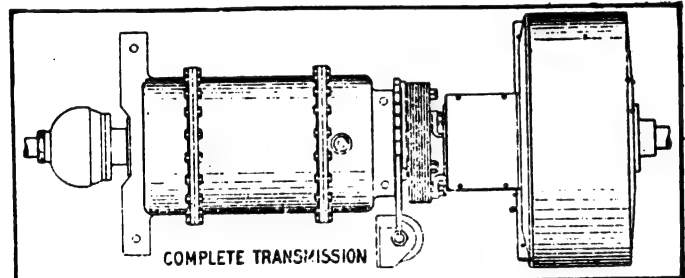
At a speed of 20 miles an hour along a level road, the contact of the carbon brushes bearing on the surfaces of the copper commutator gives sufficient friction to maintain the momentum and speed of the car without the magnetic pull. This feature is automatic.

The Vesta centrifugal-electric transmission is the product of the Triumph Electric Co., Cincinnati, O., and is understood to have been tested in all kinds of service for a period covering a number of years over several thousands of miles.

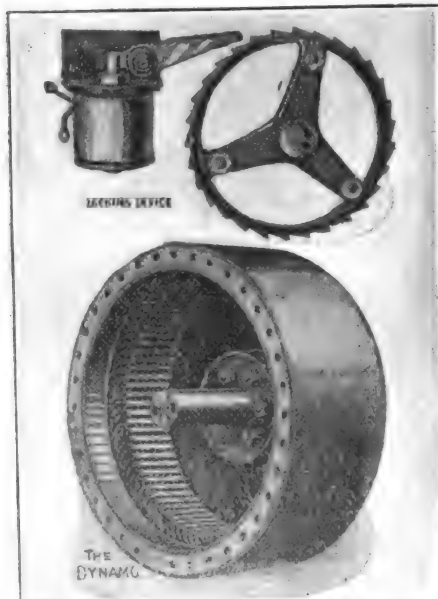
NEW YORK REGISTRATION NEAR HALF MILLION MARK.

Motor car registrations in New York state came close to the half million mark in 1916, totaling 446,205, including pleasure cars and commercial vehicles. The pleasure car registration numbered 279,930; trucks, 34,653; dealers, 2494; motorcycles, 25,812.

Receipts from license fees totaled \$2,642,158, as compared with \$1,899,916 for



The Vesta Transmission Unit.



Vital Components of the McFarlan-Vesta Transmission.

1915. The total gain in registrations for the year was 36 per cent., but the increase in number of trucks was much greater than that shown by pleasure cars, being 65 per cent.

WANT LAW TO LICENSE AUTO REPAIR MEN.

There is a movement on foot in Boston to have a bill presented to the Massachusetts Legislature providing for a law to compel automobile repair men to take out a license. In applying for such a license the men would be required to pass an examination as to their qualifications as automobile mechanics. The demand for the law, it is understood, has grown from the many differences that arise between repair shop and garage owners and motorists over repair work.

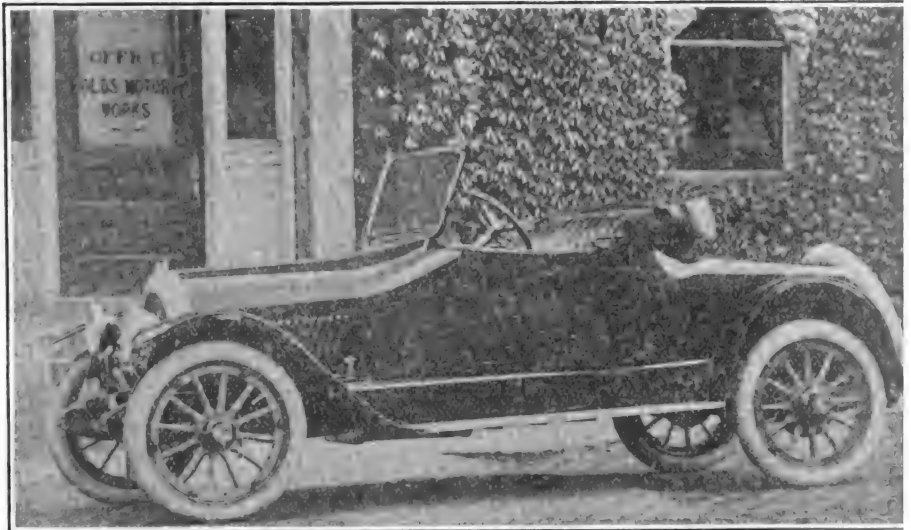
Olds Discloses New Eights, the Series 45

COINCIDENT with its entry upon its 19th year of manufacturing experience, the Olds Motor Works, Lansing, Mich., announced a new series of motor cars, known as model 45, and presented the first cars at the New York Show.

The Olds company declares its aim in offering these cars is to build a light car that in point of performance, refinement of finish and mechanical detail would be competitive with the world's finest cars.

There are four body styles in the new series, a seven-passenger and a five-passenger touring car, a four-passenger club roadster and a two-passenger roadster. The rear compartment of the latter is convertible into a leather upholstered seat for two extra passengers. These models are all mounted on the same eight-cylinder chassis.

Excellent lines and handsome propor-



The Handsome New Oldsmobile Roadster.

while high body sides and deep seats accentuate the sensation of lounging chair comfort.

In the upholstery scheme, in which bright French leather is used, small diameter springs encased in linen sacks are a special feature. The auxiliary seats in the seven-passenger car tilt forward into recesses in the floor of the tonneau and the back of the front seat, and are

further protected by leather flaps that match the flap pockets in the doors.

The distinctive Olds front compartment arrangement is retained, the features being the use of circassian walnut and silver finished instruments, mounted flush. The steering wheel is of walnut, with a nickel plated steering column, rigidly bolted to the dash.

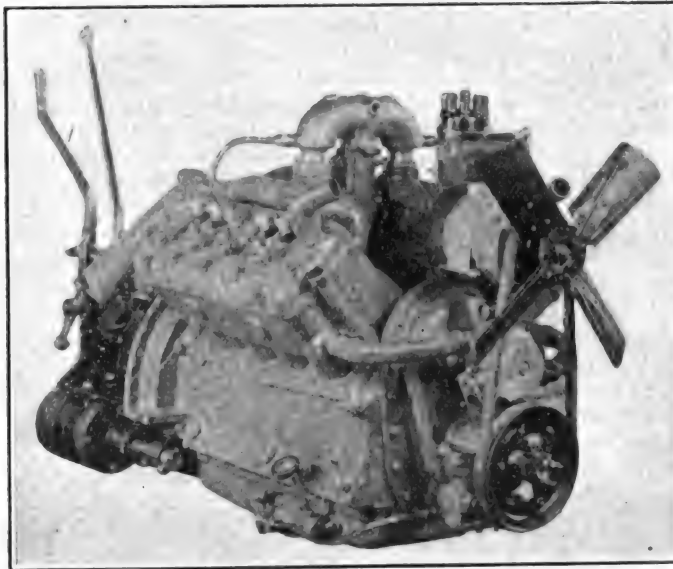
There are many minor refinements, such as leather covered body rails; combination tonneau and step light, and curtains opening with the doors.

The seven-passenger car is finished in royal green, the club roadster in royal blue and the convertible roadster in carmine, with all these colors optional for any model at a slight extra cost.

The engine of the new Olds model 45 is a refined L head, eight cylinder, V type, high speed construction, developing 56 horsepower at 3200 revolutions per minute, with a bore and stroke of only $2\frac{7}{8} \times 4\frac{1}{4}$ inches. The proportion of the power developed to total car weight is approximately one horsepower to every 52 pounds, which, coupled with the high frequency of the power impulses, one to every five inches of car travel, produces exceptional performance, with remarkable acceleration and

hill climbing ability on high gear.

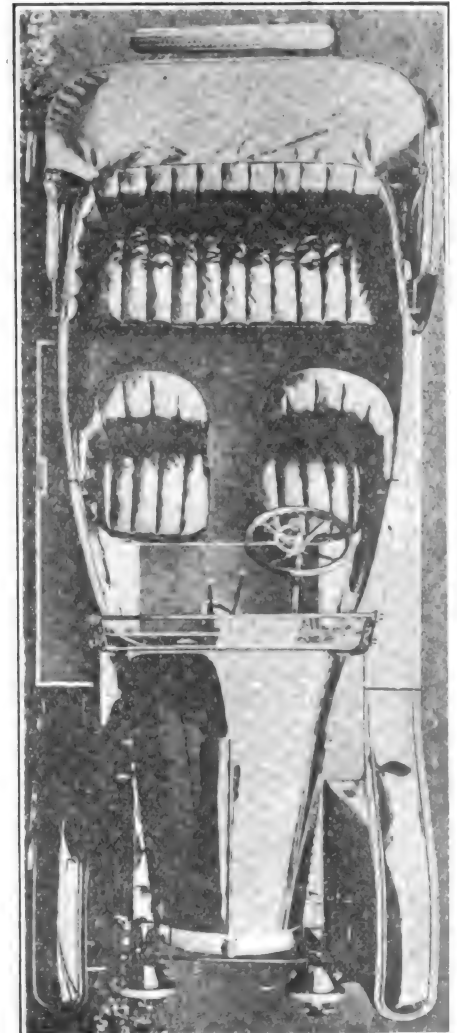
In attaining the high efficiency of the engine a counter balanced crankshaft, light weight drop forged connecting rods and nine-ounce aluminum alloy pistons are determining factors, reducing internal resistance, vibration and bearing pressures to a minimum. Other factors are large inclined valves, and an even gas distribution, due to the shortness



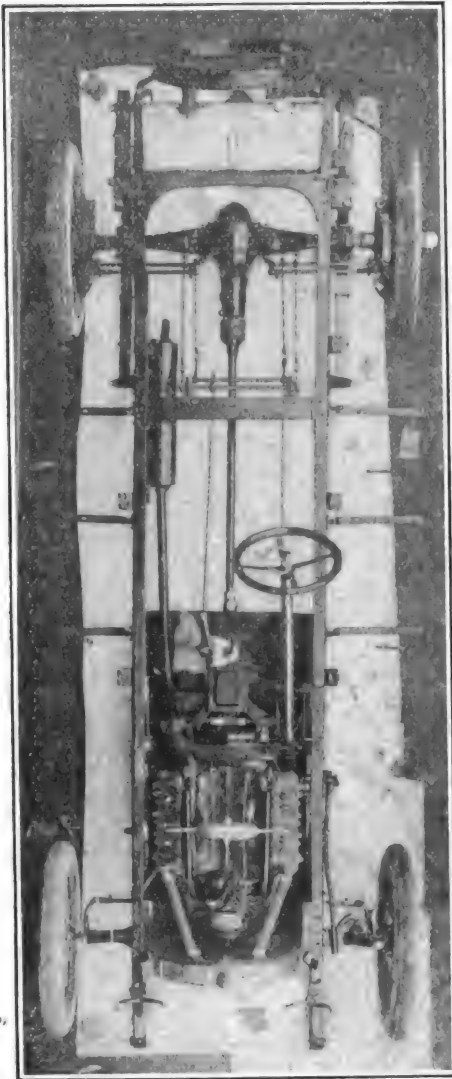
The Eight-Cylinder 56 H. P. Engine.

tions distinguish the new cars. Entirely new in Olds practice is the radiator, with its distinctive fluted oval shell of solid German silver. The starting crank spindle does not protrude through the radiator, the aperture being sealed by a nickel plated cap. A new type mud apron, with a deep and wide flare, provides protection against mud and slush, and, with the lamps, the edges of which are grooved to match the radiator, finishes off an unusually attractive front design.

Consideration of the comfort of the passengers is noticeable throughout the new models. The 120-inch wheelbase, with a very short hood, which is made possible by the compact eight-cylinder engine, provides plenty of leg room,



Interior of Five-Passenger Touring Car



The Rugged Eight-Cylinder Oldsmobile Chassis.

the cylinder blocks and the central location of the carburetor, the manifold of which is hot water jacketed.

Simplicity is a characteristic of the engine construction. There are but two main castings, each containing four cylinders and half the crankcase, with the bearings in the left hand block; this is a patented feature. Access to working parts is afforded by means of detachable cylinder heads, valve covers and oil pan. The valve lifters are mounted in a single bracket, allowing for their removal as a unit by unscrewing four bolts.

The crankshaft is unusually short and sturdy, with large bearings and integral counter weights. A single camshaft is used, with 16 integral cams, driven from the crankshaft by two helical gears, one of which is of compressed oiled fabric, and both being enclosed in a sound proof case. Forked connecting rods are used, and they have liberal sized bronze bearings, lined with a special nickel babbitt alloy.

Lubrication is by force feed, a gear pump in front of the engine block, driven by a vertical shaft and spiral gear from the crankshaft, forcing the oil through large leads direct to the main bearings and to the point of mesh of the timing

gears. From the main bearings the oil is forced through leads in the crankshaft, and through oil tubes attached to the crankshaft cheeks to the connecting rod bearings. Oil pressure is automatically governed by a regulator in the main oil line, the exact pressure being registered on a gauge.

Cooling is effected by a centrifugal pump rigidly mounted in front of the timing gear housing, and driven through a patented clip on the end of the camshaft. In the event of freezing the clip will break before the pump mechanism becomes effected. A four-blade pressed steel fan is keyed on to an extension of the generator shaft.

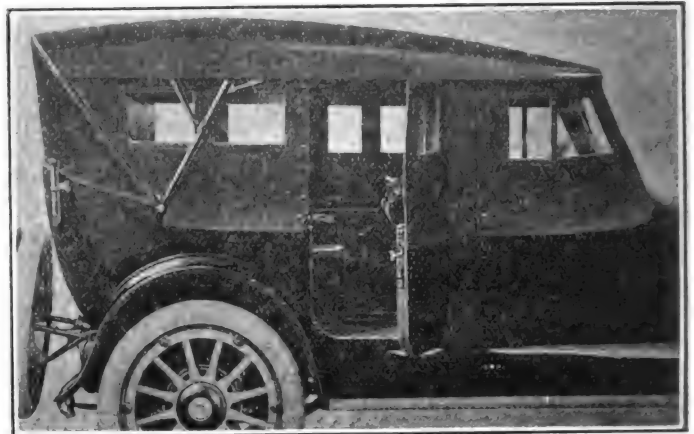
The electric system, a special Olds design, is in three units, starter, generator and distributor, each being independent. The generator is mounted on top of the timing gear housing, and is driven by a V type belt from the crankshaft. The distributor is carried on the rear of the generator and is driven positively by a vertical shaft and spiral gear from the camshaft. The starter is mounted alongside the transmission and automatically engages with the flywheel by means of the Bendix drive system.

Spark control is automatic, though the usual manual lever is provided for extreme advance and retard. Gasoline is fed by vacuum from the fuel tank suspended at the rear of the frame to an automatic compensating type carburetor, which is water jacketed.

The transmission is of the conventional selective sliding gear type, three speeds forward and reverse and in unit with the engine. The main shaft of the transmission is mounted on ball and roller bearings. The clutch, which is

integral with the power plant, is of the cone type, leather faced, with the surface raised at intervals by small springs to give easy engagement.

The rear axle is full floating, of the spiral bevel type, with a light, but strongly trussed housing of pressed steel, reducing unsprung weight. The pinion and differential are easily taken out through a pressed steel axle cover at the rear. The wheels are mounted on extra large double row ball bearings, and the differential on tapered roller bear-



Curtains Open with Doors on New Oldsmobiles.

ings, the combination being designed to effect an unusually free running and substantial assembly. The gear ratio is 4.915 to 1 in the touring cars and 4.425 to 1 in the roadsters.

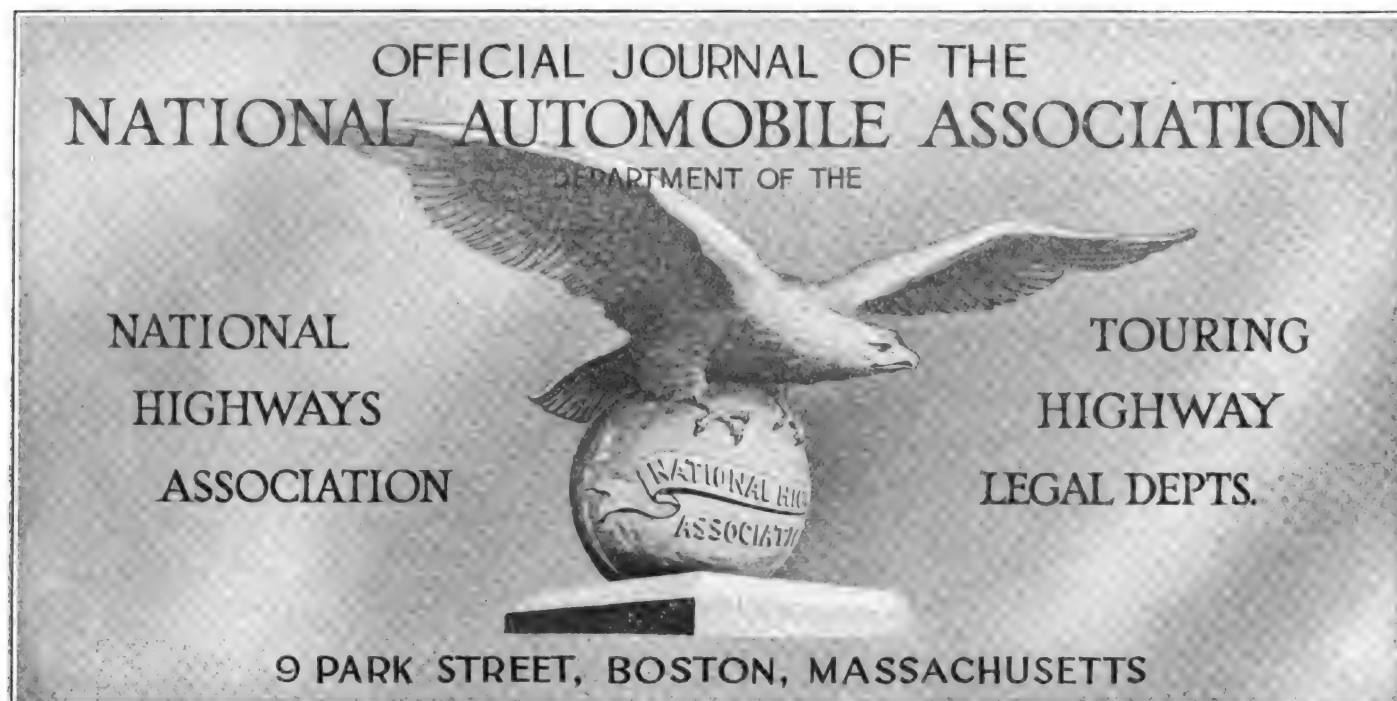
The rear springs are three-quarter elliptic and the front set long and flat semi-elliptics. Drive is through the rear springs, after the conventional Hotchkiss design. The drive shaft is tubular, with large universal joints.

The wheels are selected hickory, natural wood finish, with demountable bolted on type, straight side rims. The sizes of tires on the seven-passenger touring car are 34x4, while all other models have 33x4, non-skid in the rear.

The price of the seven-passenger touring car is \$1367, and that of the other cars, \$1295.



The New Eight-Cylinder Oldsmobile Touring Model.



COMMENCING with this issue, The Automobile Journal becomes the Official Magazine of the National Automobile Association, one of the great departments of the National Highways Association; and as an introduction to our readers who may not be familiar with these two organizations, we present a brief summary of their histories and activities.

In 1904, when owners of motor vehicles were few, and when they were subjected to many annoyances and embarrassments, a number of representative men of New England, interested in the development and use of automobiles, banded together for the purpose of safeguarding the interests of motorists and of educating the general public to the legitimate and proper use of motor vehicles upon the highways of the land. This group of men became the nucleus of the National Automobile Association, the pioneer motoring organization of its kind in the country.

Principal Objects of N. A. A.

Its principal objects were to promote a social and educational organization composed in whole or in part of persons owning self-propelled vehicles for business, personal or private use; to afford a means of recording the experiences of members and others using motor vehicles, and to promote investigation in their development and use; to plan or to co-operate in securing national and rational legislation, as well as proper rules and regulations governing the use of motor vehicles throughout the country, but more especially in the cities and towns; to protect the interests of owners and users of motor vehicles

against unjust or unreasonable legislation, and to maintain their lawful rights and privileges whenever or wherever such rights and privileges were menaced; to promote the sane driving of motor vehicles upon the highways; to co-operate with the public authorities in securing the revocation of the licenses of unreasonable, reckless or intoxicated drivers; to disseminate journals, magazines or bulletins of information concerning laws, ordinances, rules and regulations affecting motorists; to maintain legal, highway, touring, supply, insurance and other departments which members might freely consult for advice or assistance, or other benefits, as well as to provide for legal representation in the courts or before executive or legislative bodies; and, generally, to encourage and advance the construction and the proper maintenance of highways.

Has Spent Thousands of Dollars.

To this end the association established a Legal Department, a Highway Department, a Touring Department, a Supply Department and an Insurance Department, and placed each department under a competent and experienced chief; and for more than a decade these departments of the association have rendered to members services of inestimable value. Moreover, the association has spent thousands of dollars and much time and energy in its campaigns of education, and by its high-toned, honest, fair and square dealings with both the motorists and the general public it has established for itself an enviable reputation.

That the zeal and endeavors of the National Automobile Association are widely appreciated is attested by the fact that it is today one of the leading and most influential motoring organizations in the country. Its official personnel, since the beginning of the organization, has been composed of men of the highest standing in the commercial, industrial and social life of New England.

At the present time its president is the Hon. John Lewis Bates of Boston, former Governor of the Commonwealth of Massachusetts, one of its foremost citizens, as well as one of the great leaders of the Massachusetts bar.

The large membership and prosperous condition of the association at the beginning of 1917 enables it to offer to motorists services and benefits heretofore unequaled and in no way approached by any other motoring organization in this section of the Union. In a general and conservative way this is what membership in the National Automobile Association means to the motorist.

Pratt Designed Insignia.

The association presents without charge to each of its members one of its beautiful nickel eagle insignia, designed by the celebrated sculptor, Bela L. Pratt. These artistic insignia can be obtained only through membership in this association. The price of additional insignia is \$3 each.

The association presents without charge to each of its members one of the well known Red Road Books. The Red Road Book contains the latest and most accurate maps of automobile roads in the New England states, in New York, New Jersey, Pennsylvania, Maryland, Delaware, Virginia and West Virginia, besides 153 maps of city streets, and much other additional valuable information. The regular price of this book is \$2 per copy.

The Automobile Journal, one of the leading motoring publications of this country for more than a decade, which is now the official magazine of this association, is sent free fortnightly to each member. The subscription price of this



Membership Button of the N. A. A.

journal is \$1.50 a year. Through this journal the association will be enabled to keep its members fully advised regarding traps, police activities, new laws and regulations, traffic rules, roads under repair and detours, automobile tours, decisions of the courts and executive bodies, besides furnishing more than three-score pages of additional, valuable and timely information to motorists.

A special N. A. A. New England map—17"x35"—covering all of the principal automobile roads in New England, is also presented free to each member. The regular price of this map is \$1.

Besides The Automobile Journal, the association issues free during the summer months Weekly Bulletins, in which members will find many bits of special news and advice.

Complete Touring Department.

The association's Touring Department, one of the most complete of its kind, furnishes free Route Cards, of a convenient size, containing detailed directions covering more than 50,000 miles of highways. These cards also give the names of the hotels in the principal places en route, and on the back of these are unique maps, enabling one to see at a glance the names of the cities and towns along the route. This department also prepares special motor tours to any place in this country or in Canada. It also has maps of all the important transcontinental routes and of others running from Canada to the gulf. This service, which is free, is conservatively worth \$10.

Membership in the National Automobile Association also entitles you to membership in the National Highways Association. This great association is composed of more than three score representative organizations working exclusively, constantly and disinterestedly for national highways and good roads everywhere. Members are also presented with its membership button, its costly four-colored plate maps and other valuable publications. This membership costs \$10.

The N. A. A. furnishes legal advice and assistance free in all automobile troubles and accidents. Also free defense of yourself, or your operator for violations of automobile laws anywhere in New England; and in suits brought against you for damage to property, i. e., injuring or killing animals, or damaging vehicles. It also assists members in adjusting their repair bills, etc.

Free Legal Advice Given.

The legal department is maintained for the purpose of enabling members constantly to be advised as to their rights and liabilities as motor car owners. Members may consult it as often as they please without extra charge. The service furnished by the legal department is worth anywhere from \$25 to \$100, but say \$25.

The N. A. A. assists members in recovering lost cars, articles, etc. It also aids members in securing good and competent chauffeurs, and, upon request, investigates chauffeurs' records.

The N. A. A. furnishes free expert insurance advice relative to insurance

companies, policies, rates, requirements, etc., and maintains a department which will gladly obtain for members real policies in responsible companies.

The keynote of the National Automobile Association is service and benefits. It does more for its members than they imagine or expect. Annually new services and benefits are added, while the fee for membership remains at \$5 a year. No similar investment brings such re-

turns. And beside these direct profits, each member has the gratification of knowing that they are helping to maintain an organization which is furthering the great patriotic movement, so rapidly developing throughout these United States, for national highways and good roads everywhere, which will eventually tend to all our comfort and pleasure and the general development of the wonderful natural resources of our country.

NATIONAL HIGHWAYS ASSOCIATION

Its Foundation, Growth and Objects.

For the purpose of extending and increasing its interests and activities for the benefit of its members and of motorists generally, the National Automobile Association became one of the great departments of the National Highways Association, a membership corporation which exists to favor, foster and further the development of national highways and good roads everywhere in the length and breadth of these United States of America, and to secure the benefits—social, moral, commercial, industrial, educational and personal—in the progress and uplift of the American people which follow in the train of easy intercommunication and transit between the great centres of population and distribution and the great rural productive areas of the nation.

A two-fold meaning is to be read into the name of National Highways Association. It stands for national highways, as distinct from state, county or town roads, and it is a national association, as distinct from state, county, town or local road associations.

The National Highways Association is founded upon two main articles of faith: The conviction that only by the construction and maintenance by the national government of a comprehensive system of national highways, serving the total population of the country as a whole, will the great road question ever be rightly answered; and the certainty that only by the creation of a national highways commission to study and decide upon the course of action to be taken by the national government will the financial and economic problems involved in such a vast undertaking be properly solved.

In 1911 the National Highways Association was an idea—a belief—in the mind of one man, that man the present president of the association, now an organization of many thousands of members. To crystalize his idea and make of it a concrete thing, the first maps were made by engineers under his direction, the first nation-wide correspondence undertaken, getting expressions of opinions and needs from thousands of road commissioners and officials throughout the country.

In 1912 this crystalization had taken place and the association was incorporated by General Coleman DuPont, Charles Henry Davis, C. E., C. H. Claudy and their associates, in Washington, D.

C., under the laws of the national government. Two things stand forth in this crystalization of thought, as shown in the charter of the association, above all others. They are:

(1) The object of said corporation shall be to promote the establishment, building and maintenance of national and other highways throughout the United States.

(2) The funds of the association shall be used only to promote the establishment, building and maintenance of national highways and good roads everywhere.

The National Highways Association occupies quarters in its own building on Old Slip. This is an historic spot in the annals of New York City. It is one block from Wall street, now the financial heart of the world.

The belief that members and others interested have a right to demand short and pithy facts leads to the publication here of answers to four questions asked about the association by every one who hears of it. Deprived of all detail and skeletonized for ready comprehension, these four answers concern the questions as to what the National Highways Association is, what the National Highways Association is not, what the National Highways Association has done, what the National Highways Association expects to do. The last answer is two-fold and concerns the work of the association as a whole and for the nation, and also its work for the individual and the benefits to the individual in membership in the association.

What the National Highways Association Is.

- A national organization.
- An educational force for good roads everywhere.
- A believer in national highways, built and maintained by the national government.
- A publisher and distributor of national highways literature and maps.
- A practical, working, successful enterprise.
- A central and directing body, making effective the efforts of all state or local associations which affiliate with it.
- A crystalizer of public sentiment and a means for directing that sentiment to the goal of accomplishment.

What the National Highways Association Is Not.

- It is not a political organization.
- It is not a maintainer of a lobby.
- It is not a wedge for opening legislative pork barrels under the guise of "road legislation."



Hon. Charles Henry Davis, C. E.,
Founder and President of the National Highways Association.

It is not an agent for or connection of any commercial interest, whether connected with road materials, road machinery, road construction, or otherwise. It is not a servant of any business, other organization or corporation.

It is not a believer in any individual single road as more important than the system of national highways, for which it stands.

It is not an antagonist of any road organization, association or corporation interested in furthering "Good Roads Everywhere."

What the National Highways Association Has Done.

Secured a membership of many thousands throughout the nation.

Issued more than 444 maps, pamphlets, bulletins, circulars, etc., of a total circulation of more than 5,306,113 copies.

Conducted a correspondence of over 126,000 letters.

Collected over 38,000 documents, maps, data and material pertaining to roads and filed them for ready reference at the "Workshop" at South Yarmouth, Mass.

Founded and maintained the Davis Library of Highway Engineering at Columbia University, New York City, the most complete collection of books and other printed material on roads in this country.

Founded and helped maintain the graduate course in highway engineering at Columbia University.

Formed, organized or affiliated existing road organizations in divisions or departments of the National Highways Association to the number of 54.

Obtained the co-operation of 94 state governors and ex-governors in their organization as the council of governors.

Obtained the co-operation of 123 members and ex-members of the state highway commissions in their organization as council of commissioners.

Organized 63 divisions in its council of national advisors, with chairmen, and members thereof composed of the leading men in the social, intellectual, scientific and industrial activities of the nation.

Organized a national membership committee to conduct an active membership campaign under the chairmanship of Waldron Williams, Esq., of New York.

Financed Mr. A. L. Westgard's trips over the highways of the tentative system proposed by the association for the gathering of exact road data. Seventeen thousand miles were thus plotted in 1913 and 18,000 miles in 1914.

What the National Highways Association Expects to Do.

Continue to propagate sentiment for a national highways system.

Continue the publication of proceedings, maps, pamphlets and newspaper bulletins.

Continue the membership campaign, with the end of getting a closely knit organization of such size that its demand cannot fail of recognition before the national government.

Continue its organization work and its securing of the co-operation and assistance of men and women of commanding power and influence in the business, scientific, economic, political and social worlds.

Continue to give to its members all promised benefits and as many more as may be found possible.

Continue to back the Westgard trips and amplify and publish the data he obtains.

At Present Those Who Become Members of the Association Receive.

Membership certificate suitable for framing.

Membership button.

Maps and publications issued by the National Highways Association from time to time.

Free use of the club house, Old Slip, New York City.

Free use of the Davis library of highway engineering at Columbia University, New York City (which contains the most complete collection of works on highway engineering and allied subjects in this country. Open daily for the use of all members of the National Highways Association).

Right to attend all general and special meetings of the association and of any of the governing bodies and to speak thereat.

Right to vote in person or by proxy at all general and special meetings of the association.

Privilege of purchasing and using the emblems of the association—flags, eagle, radiator emblems, gold pins, etc.

Certainty of financial and social gain as a result of the early establishment of national highways and good roads everywhere, and opportunity to help in the creation of that road system which will benefit the individuals who live near, as well as those who live upon, the proposed national highways.

The National Highways Association is not a competitor of any other highway association. It has no axe to grind, no interests to serve, no individual road to push at the expense of others. It is entirely national in character, and stands for a principle and a nation-wide system. With this as a starting point it has encouraged and sympathized, worked with and helped all other associations with which it could get in touch. It believes implicitly that union produces strength, that scattered and unrelated effort is wasted. In this belief it has formed division or departments of many existing road associations, without in any way taking from them their individuality or circumscribing their local activities. A list of these affiliated bodies, which includes those formed, organized, or to be organized for the purpose of affiliation with the National Highways Association, follows:

Departments and Divisions of The National Highways Association.

National Old Trails Road Association—
National Old Trails Road Department.

Inter-Mountain Good Roads Association—
Inter-Mountain Department.

Ohio Good Roads Federation—Ohio Division.

North Carolina Good Roads Association—
North Carolina Division.

Pennsylvania Good Roads Association—
Pennsylvania Division.

West Virginia Good Roads Association—
West Virginia Division.

Texas Good Roads Association—Texas Division.

Arizona Good Roads Association—Arizona Division.

New Mexico Good Roads Association—
New Mexico Division.

Iowa Good Roads Federation—Iowa Division.

Kansas Good Roads Federation—Kansas Division.

Minnesota Good Roads Federation—Minnesota Division.

North Dakota Highway Improvement Association—North Dakota Division.

The Kentucky Good Roads Association—
Kentucky Division.

Indiana Good Roads Association—Indiana Division.

The Tennessee Highway Association—
Tennessee Division.

National Automobile Association—Massachusetts Division.

Southern National Highways Association—
Southern National Highways Department.

National Parks Transcontinental Highway Department.

Pike's Peak Ocean-to-Ocean Department.

Midland Trail Association—Midland Trail Department.

Jackson Highway Department.

Jefferson Highway Department.

Alabama Good Roads Association—Alabama Division.

Meridian Road Association—Meridian Road Department.

Atlantic Highway Department.

Pacific Highway Department.

Mississippi Highway Department.

Appalachian Highway Department.

Great Lakes-Atlantic Highway Department.

Canada, Kansas City, Gulf Highway Department.

Louisiana State Good Roads Association—
Louisiana Division.

Rocky Mountain Highway Department.

Southwest Trail Department.

Great Plateau Highway Department.

Oregon Trail Department.

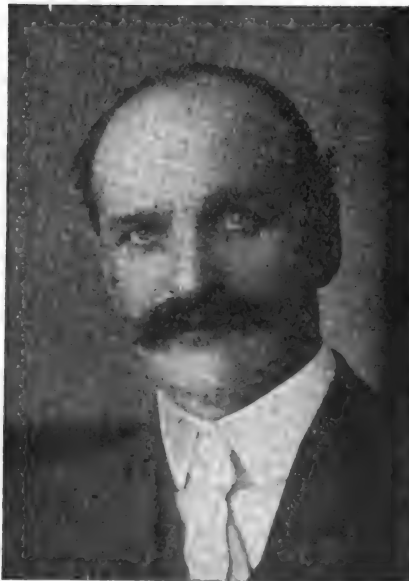
Wonderland Trail Department.

Sunshine Highway Department.

Cotton Belt Trail Department.

Trail to Sunset Department.

Indian Trail Department.



Gen. Coleman DuPont, Chairman of
Board of National Councilors of the
National Highways Association.

International Pavedway Association—International Pavedways Department.
 Astoria Trail Department.
 Old Dominion Trail Department.
 Jefferson Davis Memorial Highway Department.
 Tamiam Trail Division.
 Old Spanish Trails Division.
 Gulf Coast Division.
 Borderland Military Highway Division.
 Borderland Trail Division.
 Washington State Good Roads Association—Washington Division.
 National Parks Trail Department.
 Pioneer Way Department.
 Central Florida Good Roads Association—Florida Division.

National Headquarters, Workshops and Offices of the National Highways Association.

Corporate Headquarters, Washington, D. C.
 National Trustees, Equitable Building, New York City, N. Y.
 Board of National Councilors, office of the chairman, DuPont Building, Wilmington, Del.
 National Executive Offices, Cambridge, Mass.
 Offices of the General Counsel, Land Title Building, Philadelphia, Penn.
 National Headquarters and Club Rooms, Old Slip, New York City, N. Y.
 National "Workshop" and Drafting Rooms, South Yarmouth, Mass.
 National Organization Headquarters, office of the director general, Jamestown, O.
 Automobile Legal Department, office of the counsel, 9 Park Street, Boston, Mass.
 Northwestern Organization Department, Midland Building, Kansas City, Mo.
 Office of the Engineer of Chart Construction, Harlan, Harlan County, Ky.
 Office of the Engineer to the Board of National Councilors, 88 Broad Street, Boston, Mass.
 Davis Library of Highway Engineering, Columbia University, New York City, N. Y.

The "Workshop," where the editorial, topographical and mechanical activities are carried on, is located at South Yarmouth, Mass., on quiet Cape Cod. Here, on property donated to the use of the association by the president of the association, several buildings have been erected and joined so as to present a novel and interesting establishment.

The main office building is a long, low structure, 134 by 34 feet. Down the entire length of this room, on one side, are the drafting tables. On the other side are the desks occupied by the association's editorial and publicity department. Down the middle of the room is a

long file of safes and filing cabinets. At right angles to this office runs another long building, almost as large, in which are the office of the president, the mailing room, the filing room and the shipping department. Connected with this, by a passageway, is the stenographer's room, and adjoining that is the printing department, where the latest and most improved electrically driven mechanical equipment has been installed. Here are printed and distributed various circular letters and bulletins, the work of printing, folding, sealing and stamping being done by automatic machines.

At times as many as 40 persons have been employed at the South Yarmouth establishment, and none the least important of these is the corps of draftsmen. These men have long been engaged upon the production of road maps, delineating thereon the existing roads in every state in the Union. The association is in constant correspondence with the highway commissioners and officials of all the states. The maps are always up to date, every piece of highway work contemplated or under construction being reported immediately to the association and transcribed to its proper place on the map of the state. These maps will prove of inestimable value to the proposed National Highway Commission, and in addition will be of service, in showing the people of each state, how the national government can make use of their roads in the proposed plan.

Other offices are maintained throughout the country. The corporate headquarters of the association are located in the McLachlen building, Washington, D. C. At national headquarters there is also maintained an office of the privileges of which the members of the association are invited to avail themselves. This is located in Old Slip, New York City, where the association occupies its own club house.

The headquarters of the organization department, which is under the direction of Jesse Taylor, director general of the

association, are at Jamestown, O. A large corps of state directors is under Mr. Taylor's direction, among these being assistant director general W. A. Alsdorf, manager of the Northwestern Organization Department, with headquarters at Kansas City, Mo.; Assistant Director General Z. D. Dunlap and others.

There are two men at the helm of the association and actively engaged in directing its work and expansion. First of these is General Coleman DuPont, known the world over as the man who gave to his home state of Delaware a 2,000,000 state-long highway. General DuPont is a trustee and chairman of the board of national councilors of the association, and lends to it not only his enthusiasm for good roads and his implicit belief in the national highway programme, but the ripe experience of great business success and the keen judgment of a man of large affairs.

Charles Henry Davis, founder and first president of the association, is a civil engineer by profession, although his activities include many other lines of business. He was for many years president of the American Road Machine Company, but on the formation of the National Highways Association sold out his interests and retired from that corporation, realizing that he could not be connected with the commercial side of the road question and at the same time make a success of the association. Mr. Davis also brings to the association a keen and mature judgment, a knowledge of men, and an ability as an organizer which has built up from a single altruistic idea the largest and most closely knit organization in all the world exclusively devoted to the cause of national highways and good roads everywhere.

An exceptionally strong national membership committee is in charge of this activity of the association. The chairman of this committee is Waldron Williams of New York City, who has for years been active in road matters. He is influential

throughout the country, both financially and socially. He is ably supported by such well known national and international road enthusiasts as Cortland F. Bishop and Albert R. Shattuck. Other most active men on the committee are the well known architect, Ernest Flagg, and D. McRa Livingston of New York City, as well as Schuyler S. Wheeler, head of the well known firm of Crocker, Wheeler Company, manufacturers of electrical machinery.



The "Workshop" at South Yarmouth, Mass., Where Editorial, Topographical and Mechanical Activities Are Carried On.



AS WAS stated in the last issue, the two-car wooden garage is advantageous as an investment and as a means of providing lower housing costs for the private owner, but the existence of thousands of single garages testifies to the fact that the question of expense is not always the controlling factor in shaping one's decision as to what type to build.

Garage Should Match House.

The man who owns a home usually takes pride in its maintenance, as it represents the tangible results of his planning and labors and the crystallization in material form of his ideas and tastes. When he comes to build a garage the same influence guides him. He wants the building to harmonize with the main building on his property. He exercises the same care in judgment and action as prompted him in selecting the plans and design for his home and wants a neat, substantial and well finished structure, as it increases the value of the estate, in addition to imparting considerable pride or satisfaction to its owner by reason of its quality.

When a person has the use of a garage exclusively he takes more interest in its equipment and care and in many respects finds it a far more satisfactory arrangement than sharing it with others who come at all times of the day and night, increasing the hazard of theft and fire or disarranging equipment about the building.

A Good One-Car Garage.

The one-car garage shown in the accompanying plans is ideal for the average car owner, being comparatively inexpensive to construct and of wood, a material which can be obtained with little difficulty at most any place. Wood is also an advantageous construction material for garage purposes, as it affords an opportunity of artistic design or finish to

harmonize architecturally with the surrounding buildings. As is shown in the sketch of the completed garage, which forms the heading of this article, it is subject to treatment that would conform to any type or style of building and can be made ornamental as well as serviceable at a very small outlay.

The question of the cost of such a garage cannot be even approximated, owing to the fact that labor, which is the biggest cost item in its construction, varies in cost in different localities. Equipment cost is another factor and depends upon the extent to which the owner intends to indulge his wants. The sum of \$100 or \$1000 might be spent for equipment and in either case the facilities would be satisfactory. The garage shown is equipped with gas tank, pumping equipment, pit, work bench, electric lights, folding sliding doors, water connections, sewer connections and heating apparatus. It is fitted with concrete floors and three-section sliding door, swung on a steel track.

Beveled Siding Employed.

It will be noticed that the novel exterior design is worked up through the use of beveled siding to the window line (1) and shingles above that and on the roof. A plain finish or other treatment of the exterior is suitable, but the owner should bear in mind that the building should be of a type to enhance the value of his property and not one that would prove an eyesore and detract from its value.

The selection of the material that does not show in the finished structure should be given attention as permanency is an asset. Good lumber and hardware are the best and cheapest in the long run and the use of defective material usually brings the owner to an early realization of his error by extra maintenance and depreciation charges that result.

There is sufficient detail and data given in the accompanying sketches to enable a competent contractor to either make an estimate on the cost of such a garage or even to construct it under the owner's guidance.

AUTOMOBILE FIREBUGS INDICTED IN NEW YORK.

A grand jury in New York state has brought indictments against three "firebugs" who were accused by an insurance company of burning up automobiles to obtain the insurance money.

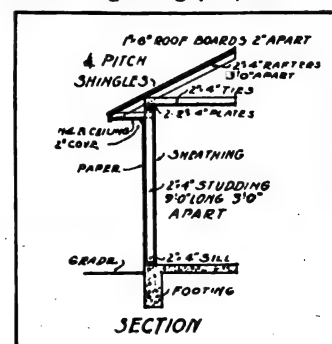
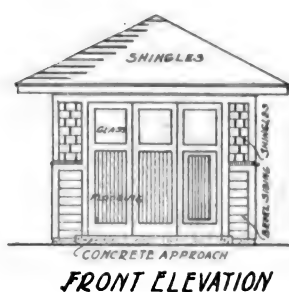
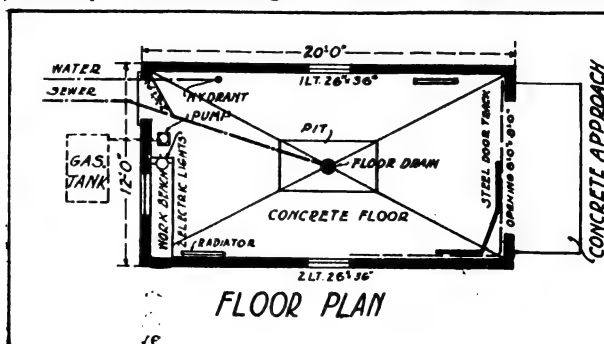
One of the men is said to have confessed that he and one of the other men implicated had burned up no less than 30 cars. They obtained the money by insuring old machines for as much as they could get and then would take them to some secluded spot and set them afire by pouring gasoline over them and igniting it. One man while carrying out this part of the conspiracy was nearly burned to death, the gasoline that had spilled on his clothes catching afire.

SUBSTITUTE FOR RUBBER FROM THE OCTILLO BUSH.

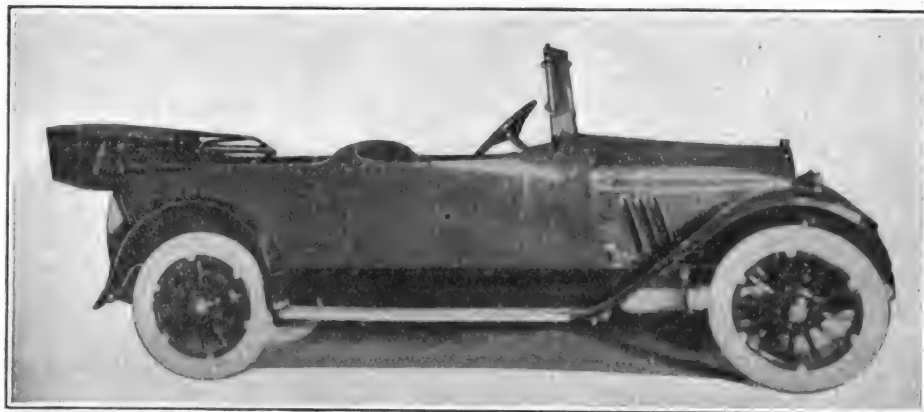
It is thought that the octillo bush, which grows in great profusion in Arizona, may furnish a substitute for rubber to be used in the manufacture of automobile tires and many articles that are now made from rubber gum.

It is reported that through the use of special machinery a gum better than Mexican chicle can be produced from the bush and that this gum has been worked into a tire which gave a satisfactory test when experimented with.

It is claimed that about 400 tons of octillo may be harvested from each acre where it grows and that the land can still be used for grazing purposes.



Data for Building a One-Car Wooden Garage, with Layout of Equipment, Etc.



American Six Five-Passenger Touring Car.

LOUIS CHEVROLET, the celebrated racing driver, designed the new American Six, which the American Motors Corp., Plainfield, N. J., was recently organized to produce. In it is incorporated standard parts made by well known manufacturers, but these parts are assembled in a manner that make the car distinctive in its class. Strength and durability are evident in the standard frame, axles, springs, transmission, steering gear and other important assemblies of the car. All materials are of the first grade. Nickel steel, case hardened and heat treated is used throughout for the gears.

Some Detail Features.

In equipment details the designer has displayed considerable ingenuity and common sense, especially in the arrangement of the instruments on a detachable panel in the cowl board, the employment of armored single wiring throughout, the concealment of the cables of the headlights, which themselves are distinctive in design, and the mounting of the starting pedal and the accelerator.

The American corporation is concentrating on a six-cylinder, five-passenger model to start with, planning for 3000 production during 1917. The body is a true streamline design, in which dignity

and simplicity predominate and trimness is an outstanding feature. The front dash and the back of the front seat are paneled in walnut and the robe holder is a heavy leather rope, detachable at either end. A soft rug covers the floor of the rear compartment and the running board is laid with linoleum bound with aluminum.

42.5 Horsepower Engine.

The engine of the American Six is an L head block casting with enclosed valves on the left hand side and developing 42.5 horsepower at 2000 revolutions per minute on block test. The S. A. E. rating places the horsepower at 21.6, the bore and stroke being three by five inches. The crankshaft is carried on three bronze bearings lined with babbit. Pistons are of cast iron, each having three eccentric rings above a hollow wristpin, and in addition there is an oil groove on the skirt of the piston to check excess lubricant entering the combustion chamber.

The camshaft is supported in bronze bearings and is enclosed to obtain the maximum benefits from lubrication. Helical timing gears are employed. The camshaft gear drives the centrifugal water pump, a tire pump and the lighting generator, as well as actuating the three-bladed fan.

Lubrication of the power plant is effected by the combined force feed and splash system. The oil pump is a plunger type and is operated off the camshaft by an eccentric, drawing the oil from the sump through a copper pipe directly into the camshaft housing and from there through tubes to troughs under the connecting rods scoops. Lubricant is splashed to the timing gears, main bearings, cylinder walls, connecting

Details of the New Car to Motordom—

rods and to the piston rings.

Special Cooling System.

A feature of the cooling system is the method of conveying the water from the centrifugal pump to the jackets, as well as the mounting of the fan bracket. This bracket is a combined fan support and water inlet pipe, it being a square hollow casting, which is secured in position by four bolts and nuts. The radiator is a Candler cellular type.

The Carter gravity system of fuel supply has been adopted, the main tank at the rear of the frame having capacity of 17½ gallons. The carburetor is a Zenith make and is mounted on the right hand



Stripped Chassis from Driver's Position.

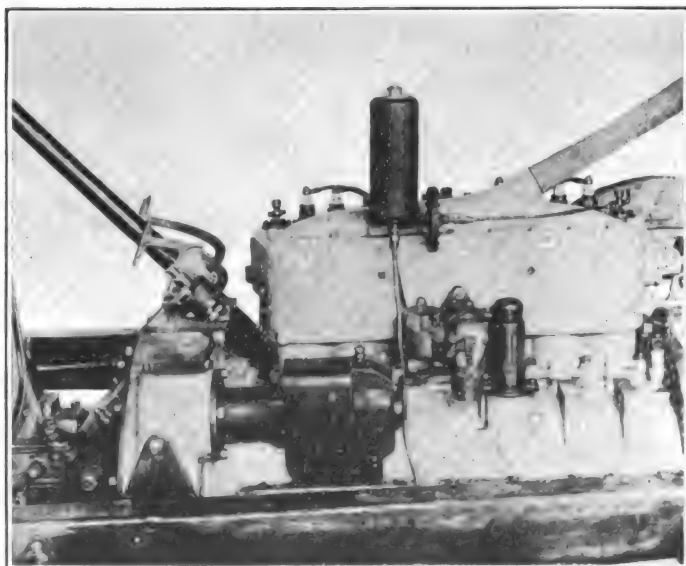
side of the engine block, connection with the intake passages being by means of an aluminum manifold. Preheating of the fuel is achieved by leading the heat from the exhaust to a stove on the intake.

Gray & Davis starting, lighting and ignition equipment, separate units, is used. The starter, which is connected with a Willard battery under the floorboards of the front compartment by means of a short cable, is mounted on the right hand side of the engine and has the Bendix drive off the flywheel. All wiring is protected by armor.

Borg & Beck Clutch.

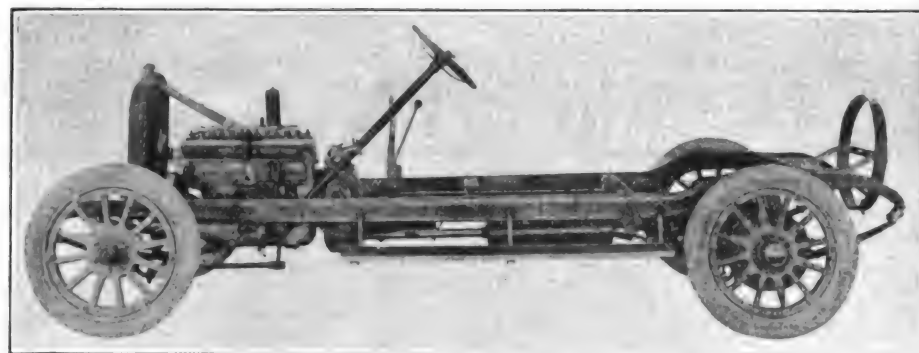
The engine is suspended at three points and is in unit with the Borg & Beck three-dry-plate disc clutch and the three-speed and reverse selective gear-set.

The rear axle is a three-quarter floating construction, spiral bevel gear type, the pinion shaft being mounted in New Departure ball bearings. Hyatt high duty bearings are used in the differential and the same make bearings are employed in the wheels. The gear ratio is 4.425 to 1. The brakes operate on 14-inch drums on the rear wheels and have



Intake Side of Engine Showing Mounting of Carburetor.

American Six, a Disclosed 45 H.P. Engine



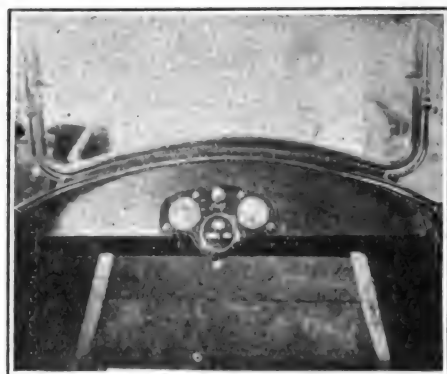
Note Rugged Mounting of Footboard.

separate equalizers, above and below the pressed steel axle housing. The front axle is a standard I beam construction, one-piece drop forged and of rugged proportions.

Semi-Elliptic Springs.

As regards springs, the front and rear sets are semi-elliptics, those at the rear being underslung, measuring 52 by two inches and with seven leaves. The springs take the final drive. In mentioning its springs, the American corporation lays particular stress upon the fact that it employs chrome silicon manganese steel, treated in electric furnaces.

The wheels are wooden, artillery type,



Detachable Instrument Panel.

equipped with demountable quick detachable Detroit rims, they carrying 32 by four-inch straight side tires front and rear.

The wheelbase is 122 inches, 56 inch tread, and the frame is a decidedly tapered construction with liberal reinforcement throughout to obtain the greatest strength possible, although lightness has been retained.

Concealed Wiring.

An unusual method of concealing the wiring of the headlights is seen in the American Six. The designer has run the cables in the channel of the frame and thence up through a hollow bracket to the rear of the lamps. The headlights are provided with two bulbs and all lights on the car are controlled at the driver's compartment by means of the combined ignition and light switch, which is provided with a strong lock.

Standard equipment included in the price of the car which is \$1285, consists of a one-man top, quick detachable curtains, rain vision windshield, two-unit headlights, dash and speedometer light, motometer, engine driven tire pump, a complete set of tools and an extra rim.

TOTAL OF 1,617,708 CARS PRODUCED IN 1916.

There were 1,617,708 motor cars, including pleasure and commercial vehicles, produced in 1916, with a value of over a billion dollars, according to the figures just made public by the National Automobile Chamber of Commerce.

This enormous product came from 400 different factories and was distributed by 30,000 dealers in this country and abroad. The total includes 1,525,578 passenger cars and 92,130 trucks, with a value of \$921,378,000 and \$166,650,273 respectively, or a total of \$1,088,028,273, which represents the retail value of the product.

OMAHA POLICE HAVE STOLEN CAR DEPARTMENT.

A stolen car department has been established by the police department of Omaha, Neb., and the automobile dealers and garagemen within a radius of 250 miles of the city are co-operating in the new plan to discourage the theft of automobiles by "killing" the sale of second hand cars.

It is proposed to have the dealers and garagemen report to the department cars which are known to have been purchased from persons coming into the territory and prospective car buyers are warned against purchasing cars from strangers. Stolen car bulletins are mailed to dealers and garagemen as fast as names can be compiled and at present there are over 800 dealers in the powerful organization.

Upon the report of a suspicious second hand car sale in their territory, garage men in other cities investigate the matter and take the license and engine number. Transient

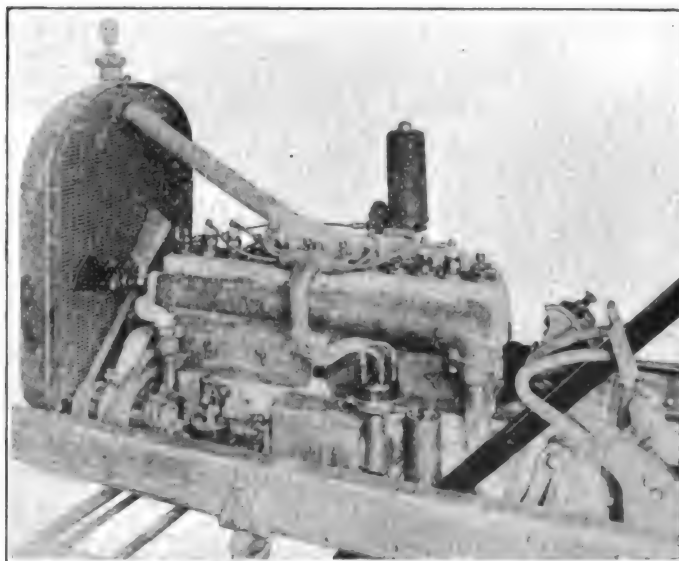
trade stopping for gas and supplies are investigated.

The auto thief would have to stop some where in the 250-mile radius for gas or supplies and by the new system of keeping every one of the garages and dealers posted his chances of getting away with a car are greatly lessened.

The Omaha Automobile Club pays \$25 for the arrest and conviction of a thief stealing a member's car.

NEW WILLYS-OVERLAND PRICES ANNOUNCED.

The Willys-Overland Co., Toledo, O., manufacturer of Overland and Willys-Knight cars, has sent out the 1917 price list, which became effective on the first of the year. The various models are listed as follows: 90-touring, \$665; 90-roadster, \$650; country club, \$750; panel delivery, \$700; express delivery, \$675; 90-delivery chassis, \$635; 85b-4 touring, \$850; 85b-4 roadster, \$835; 85b-4 touring coupe, \$1250; 85b-4 touring sedan, \$1450; 85-6 touring, \$985; 85-6 roadster, \$970; 85-6 touring coupe, \$1385; 85-6 touring sedan, \$1585; 88-6 touring, \$1325; 84 coupe, \$1650; 84 roadster, \$1095; 88-4 touring, \$1285; 88-4 touring sedan, \$1950; 88-4 limousine, \$1950; 88-8 touring, \$1950; 1200-pound delivery, \$850; 1200-pound delivery chassis, \$800.



Exhaust Side of Engine Showing Arrangement of Accessories.

COMING EVENTS

AUTOMOBILE SHOWS.

Asheville, N. C., Asheville Auto Trade Assn.Jan. 25-27
 Chicago, Ill., National Automobile Chamber of Commerce, at Coliseum and First Reg. Armory..Jan. 27-Feb. 3
 Columbus, O., Columbus Dealers' Assn., at Memorial Hall Jan. 27-Feb. 3
 York, Penn., York Automobile Dealers' Assn.....Jan. 27-Feb. 3
 Fall River, Mass., Fall River Dealers' Assn., at Casino.....Jan. 29-Feb. 3
 Wilmington, Del., at Hotel Du Pont,Jan. 29-Feb. 3
 Minneapolis, Minn., Minneapolis Auto Trade Assn.....Feb. 3-10
 Boston, Mass., American Road Builders' Assn., at Mechanics' Bldg. Feb. 5-9
 Bangor, Me., Bangor Automobile Assn.Feb. 5-10
 Nashua, N. H., F. Homer Wingate, Mgr., at Tremont Bldg.....Feb. 5-10
 Hartford, Conn., Hartford Auto Dealers' Assn., at State Armory..Feb. 10-17
 San Francisco, Cal., Motor Car Dealers' Assn., at Exposition Auditorium.....Feb. 10-18
 Toledo, O., Toledo Auto Shows Co., Terminal Bldg.....Feb. 11-17
 Bay City, Mich., at Armory....Feb. 12-17
 Elmira, N. Y., Elmira Automobile Dealers' Assn.....Feb. 12-17
 Indianapolis, Ind., Indianapolis Auto Dealers' Assn., Steinhart Bldg.Feb. 12-17
 Louisville, Ky., Louisville Auto Dealers' Assn., 1st Reg. Armory..Feb. 12-17
 Sioux City, Ia., Sioux City Auto Dealers' Assn., at Armory.....Feb. 12-17
 Kansas City, Mo., Kansas City Motor Car Dealers' Assn.....Feb. 12-17
 Watertown, N. Y.....Feb. 14-17
 Peoria, Ill., Automobile and Accessory Dealers' Assn., at Coliseum..Feb. 14-17
 Racine, Wis., Racine Auto Show Assn.....Feb. 15-17
 Newark, N. J., Newark Auto Dealers' Assn., at 1st Reg. Armory..Feb. 17-24
 Albany, N. Y., Albany Auto Dealers Assn., at State Armory....Feb. 17-24
 St. Louis, Mo., Auto Mfrs. and Dealers' Assn.....Feb. 18-24
 Portland, Me., Portland Auto Dealers Assn., at Exposition Bldg...Feb. 19-24
 Syracuse, N. Y., Syracuse Auto Dealers' Assn., at State Armory..Feb. 19-24
 Grand Rapids, Mich., Automobile Business Assn., at Klingman Bldg..Feb. 19-24
 Des Moines, Ia., Des Moines Auto Dealers' Assn., at Coliseum.....Feb. 19-24
 Duluth, Minn., Duluth Auto Dealers' Assn., at New Armory.....Feb. 19-24
 St. Louis, Mo., St. Louis Auto Dealers' Assn., at Overland Bldg....Feb. 19-24
 Bridgeport, Conn., Coast Artillery Corps, at Armory.....Feb. 19-24
 Pittsfield, Mass., J. J. Callahan, Mgr., at Armory.....Feb. 19-24
 South Bethlehem, Penn., at Coliseum.....Feb. 19-24

Brooklyn, N. Y., Brooklyn Auto Dealers' Assn., 23d Regiment ArmoryFeb. 24-March 3
 Omaha, Neb., Omaha Auto Show Assn., at Auditorium.....Feb. 26-March 3
 Wilkes-Barre, Penn., Auto Dealers' Assn.....Feb. 26-March 3
 Atlanta, Ga., Atlanta Auto Trades and Accessory Assn., at AuditoriumFeb. 27-March 4
 St. Joseph, Mo., Auto Dealers' Assn., at Auditorium.....Feb. 28-March 3
 Urbana, Ill., Automobile Trade Assn., at Armory.....March 1-3
 Boston, Mass., Boston Auto Dealers' Assn. and Boston Commercial Motor Vehicle Assn., at Mechanics' Bldg., Chester I. Campbell, Mgr..March 3-10
 Fargo, N. D., Gate City Auto Show Co., at Auditorium.....March 6-9
 Ft. Dodge, Ia., G. W. Tremain, Mgr., at New Terminal Warehouse..March 6-10
 St. Joseph, Mo., St. Joseph Auto Show Assn., at Auditorium.....March 7-10
 Trenton, N. J., Trenton Auto Trade Assn., at 2d Reg. Armory..March 14-17
 Davenport, Ia., Tri-City Auto Trade Assn., at Coliseum.....March 14-17
 Pittsburg, Penn., Auto Dealers Assn. of Pittsburg, at Motor Square Garden.....March 17-24
 New Haven, Conn., New Haven Auto Dealers' Assn., Hotel Taft..March 19-24
 Cedar Rapids, Ia., Automobile Trades Assn.....March 19-24
 Calumet, Mich., Frank Ketchell, Mgr., at Coliseum.....April ..

AUTOMOBILE RACES.

Los Angeles to Salt Lake City, Road..April ..
 New York, Sheepshead Bay, Speedway, Metropolitan.....May 19
 Indianapolis, Ind., Championship, Speedway.....May 30
 Chicago, Ill., Championship, Speedway.....June 9
 Cincinnati, O., Speedway.....June 23
 Omaha, Neb., Championship, Speedway.....July 4
 Des Moines, Ia., Championship, Speedway.....July 14
 Tacoma, Wash., Championship, Speedway.....July 28
 Kansas City, Mo., Speedway.....Aug. 4
 Cincinnati, O., Championship, Speedway.....Sept. 3
 Providence, R. I., Championship, Speedway.....Sept. 15
 New York, Sheepshead Bay Speedway, Championship.....Sept. 29
 Kansas City, Mo., Speedway.....Oct. 6
 Chicago, Ill., Speedway.....Oct. 13
 New York, Sheepshead Bay Speedway.....Oct. 27

CONVENTIONS, ETC.

American Road Builders' Assn., 8th Annual Convention, at Mechanics'

Bldg., Boston, Mass.....Feb. 5-9
 American Assn. of Garage Owners, Convention, at Auditorium Hotel, Chicago, Ill.....Feb. 1-2
 National Auto Trade Assn., meeting at Hotel Gibson, Cincinnati, O..March ..

COMMISSIONER WOODS ON TRAFFIC RULES.

Arthur Woods, police commissioner of New York City, in an address at a meeting of the Motor Truck Club of America, held at the Automobile Club in New York City, gave an analysis of the circumstances surrounding the 25 fatalities resulting from motor truck accidents in that city during November. He also suggested four rules as a means of eliminating these accidents, as follows:

Use every possible care in the selection of the driver.

Look after the condition of the truck. Be certain that it is in mechanical condition to meet every emergency.

Don't rely too much on the horn. Avoid its overuse.

Be careful in keeping the driver physically and mentally to the top notch of his efficiency.

In the course of his remarks he brought out the following points, which he gave as a means by which the truck operators could more appreciate the precautions that must be taken to lessen the death rate resulting from truck accidents.

"The town today is suffering from a plethora of traffic. We cannot slow it down or we will come to a standstill. We must keep it moving fast and we must keep it moving safely.

"There should be a margin of safety for both the pedestrians and motor truck drivers; each allowing for the carelessness or the recklessness of the other.

"Of the 25 persons killed by motor trucks last month, most of them were children or old persons. I have found from the records that six or eight of these deaths were unavoidable.

"In the streets of New York 2000 accidents occurred last month and from 70 to 80 resulted fatally. This is an awful record and it compels both the police and machine drivers to take every precaution. We must expedite traffic but let us expedite it with safety."

In two of the cases where children lost their lives, he said death was the result of the mechanical unfitness of the cars and many other cases resulted from the failure of brakes to work properly.

Continuing, he said: "I know that in November five deaths were caused by an overdose of the horn. There are occasions when sudden blasts of a horn bewilder pedestrians. The chauffeur goes along on the understanding that his horn will clear a way for him. Many times it has the opposite effect."

In the other cases where the accidents resulted fatally, he said six were the result of thoughtlessness of drivers and persons afoot; two crossed the streets with traffic hidden from view by their umbrellas; two were reading newspapers while crossing the streets and the others were victims of drivers' carelessness.



FORD HEADLIGHT REGULATOR.

The Perrin Ford Headlight Regulator will interest owners of Ford cars equipped with electric systems installed at the Ford factory. In this system the lighting current is taken from the magneto, and at speeds of 10 miles or over the supply is adequate. But under that speed, when light is needed for rough roads and turning corners, etc., the light becomes quite dim. The Perrin regulator is designed to overcome this trouble, concentrating all the available current in the right hand lamp at low speeds, and without slowing down the engine. When higher speeds are attained the other lamp takes its normal share of the current automatically. The regulator can be installed by any owner and in very short time; the only tool needed is a monkey wrench. Installation requires no change in the car's wiring nor the boring of holes in metal or wood.

Made by the Perrin Mfg. Co., Detroit, Mich., and for sale by all dealers at \$1 each.

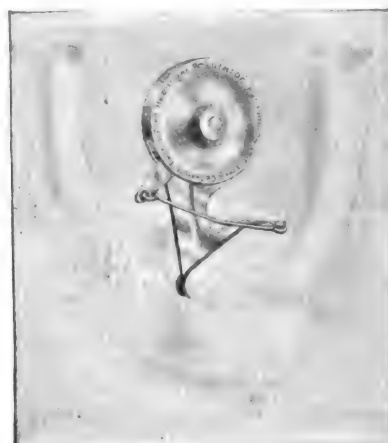
PUNCTURE PROOF INNER TUBES.

The Sternwear puncture proof inner tubes were displayed for the first time at the New York Automobile Show and attracted much attention. The maker advises that they are designed to give upwards of 20,000 miles of service without puncture or blowout because of their patented construction, and that they have been subjected to almost every test conceivable before they were placed on the market. A million dollar concern was recently organized to manufacture these tubes.

Made by the Sterns Tire and Tube Co., St. Louis, Mo. Complete details and prices to be had from the manufacturer, who has an interesting agency proposition for dealers.



Four Simplex Automobile Jacks.



Perrin Ford Headlight Regulator.



Sternwear Puncture Proof Tube.

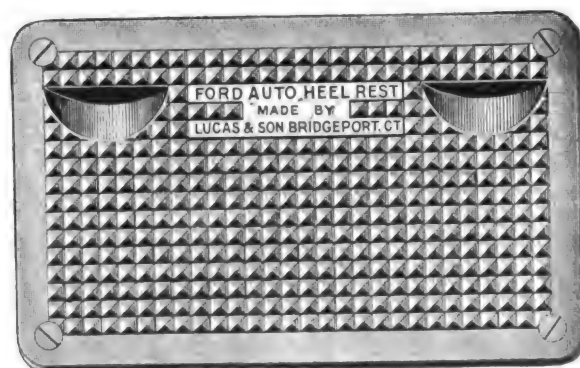
AUTO HEEL REST FOR FORDS.

This is a simple device intended to relieve the driver of the strain that customarily results from holding the foot on the clutch and brake pedals for any length of time. It is made of frosted aluminum with a $\frac{3}{8}$ -inch polished band. Furthermore, such a device protects the rubber mat on the driver's compartment of a Ford car from being quickly worn out by pressure and friction of a shoe heel. The pyramids and raised letters on the rests are cast solid and will not flatten or wear through, nor rust or tarnish. The rests are made $\frac{1}{2}$, 1, $1\frac{1}{2}$ and 2 inches high and are supplied for all makes of cars.

Made by J. L. Lucas & Son, Bridgeport, Conn. Sold by all dealers at \$1 each. Dealers will be interested in the maker's selling proposition.

SIMPLEX AUTOMOBILE JACKS.

Simplex automobile, industrial and railroad jacks have been on the market for a number of years and are widely used in those fields. Four types for motor car work are illustrated herewith, Nos. 36 and 38 being single acting jacks, operating on the downward stroke, and the other two, Nos. 41 and 43, are double acting. Aside from their unusually rugged construction, the outstanding feature of the Nos. 36 and 38 jacks is the middle adjustable shoe, which allows the jack to be used in several difficult positions. The other two jacks have adjustable and detachable shoes that set snugly into the cap, swing in an arc of 180 degrees and are available in every position. This shoe is especially valuable when jacking at an angle or lifting the entire rear end of a car on a crowned road. All Simplex jacks are black



Lucas Heel Rest.

japaned and baked, and the complete line is described in a handsomely illustrated catalogue sent free by the maker.

Manufactured by the Templeton, Kenly & Co., 1020 South Central Ave., Chicago, Ill. Write for catalogue and prices.

PETELER FOOT TIRE PUMP.

As its name implies, the Peteler Foot Tire Pump is designed to be operated by a person's foot, the action being somewhat similar to that of walking and practically just as easy. There is no strain on the back or arms, as when operating the hand pump type, and one is able to bring a greater pressure to bear through placing the weight of the body on the pedal. The pump is an ingenious and compact construction and practically indestructible in any service. It is small enough to be carried about in the car and large enough to be used to inflate the largest of tires. It is finished in baked-on black enamel with nickel trim. The maker will supply complete details of construction if they are desired, or your dealer will give a demonstration.

Marketed by Moreau & Pratt, Inc., 1834 Broadway, New York, N. Y. Retail price, \$5.

EAGLE CLAW HANDY WRENCH.

The Eagle Claw Handy Wrench, as the name implies, is a plier type of tool with specially shaped jaws to make possible a firm grip on variously shaped nuts, rods, pipes, or to secure a hold on parts in places not accessible to the jaws of conventional wrenches. They are made of dropped forged steel and very simple in construction. One type has the jaws set at right angles to the stem and the other has jaws set at an angle of 45 degrees.

Made by the Mechanical Specialties Co., People's Gas Bldg., Chicago, Ill. Prices on application.

SAFETY STEERING DEVICE.

The Safety Steering Gear Attachment for Ford cars is designed to prevent the steering wheel from passing centre when turned too far. It consists of a two-section clamp that is installed on the steering gear shaft directly above the steering gear bracket and turns with the shaft. It is adjusted and clamped into position when the steering wheel is turned full to the left, in which position it forms a stop on the bracket and insures against the wheel being turned too far.

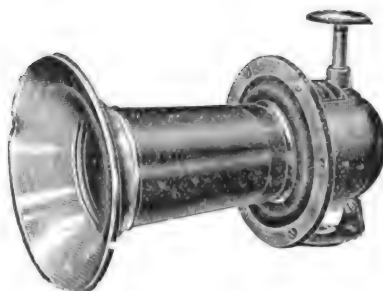
Made by the New York Coil Co., 338 Pearl St., New York, N. Y. Price, \$1.

WONDERTONE HORN.

The Wondertone Horn is a mechanically operated warning signal that employs no gears and is guaranteed to give service. The chief claim advanced by the maker is its simplicity of construction, which provides freedom from trouble. The plunger automatically springs back without friction and does not stick. The mechanism is said to be



Peteler Foot Tire Pump.



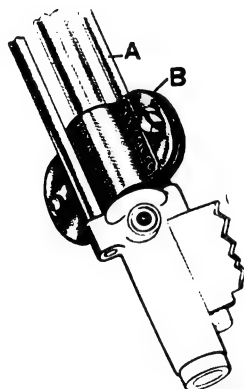
Wondertone Horn.



Eagle Claw Wrenches.



Oil Filler.



Safety Steering Gear Attachment.



Laurent-Cherry Pulley Block.

absolutely water proof and requires only a drop of oil to lubricate. Because of its constructional features it cannot rattle.

Made by the Motor Appurtenances Corp., Broadway and Eighth Ave., New York, N. Y. Retail price, \$3.

OIL FILLER AND BREATHER.

The Premo Oil Filler and Breather is claimed to be the lightest and neatest filler on the market. The illustration shows a means of fastening that the maker claims makes it impossible for the device to work loose or rattle. The hook engages the timer spring bolt, which passes through the breather opening. The wing nut is to provide a secure fastening and the oil strainer is held firmly between two rings. The Ford filler cap fits into the cover of the Premo. The whole device has a baked black enamel hard rubber finish.

Made by the New York Motor Car Device Co., 200 Eleventh Ave., New York, N. Y. Price, 75 cents.

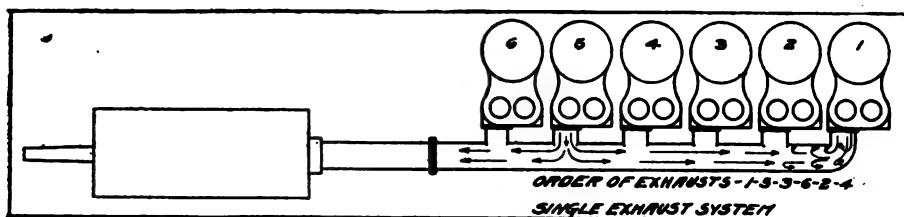
LAURENT-CHERRY PULLEY BLOCK.

The principle upon which the Laurent-Cherry Pulley Blocks are operated is similar to that employed in a capstan on board a ship, and the maker declares that because of this principle one man can pull or hoist with a Laurent-Cherry Pulley Block as much as five men could with triple blocks. They are designed for a variety of purposes and are especially valuable equipment for hoisting engines, cars and the like, as well as for pulling motor cars out of deep mud when stuck on the road. There are several sizes made, from the kind designed for the heaviest of industrial work to the "Baby" size that is especially adaptable for carrying around in the car to pull the machine out of mud holes.

Made by the Laurent-Cherry Pulley Block Co., Trenton, N. J. Write for catalogue and prices.

1917 EDITION OF MOTORIST'S RECORD ISSUED.

The manufacturer of Walden-Worcester wrenches, the Walden-Worcester, Inc., formerly known as the Walden Mfg. Co., announces the publication of the 1917 edition of its Motorist's Record, which earned such wide favor among car owners last year. The booklets are of handy vest pocket size and provide means of keeping a complete record of the cost of operating a gasoline car, as well as other valuable data. There are divisions for recording the cost of gasoline, oils and tires bought and used, with subdivisions showing when, of whom and in what quantities each article was bought, and also means for quickly determining the average cost of each. Any car owner can obtain a Motorist's Record free of charge by applying to the Walden-Worcester, Inc., Worcester, Mass. Dealers and garage men can obtain large quantities for distribution among their patrons and without charge.



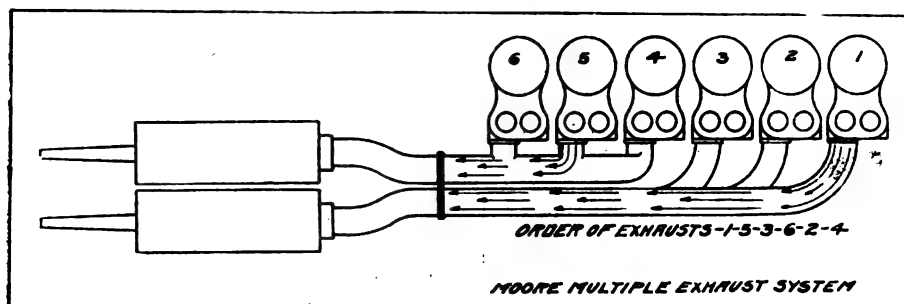
Illustrating Back Pressure in Single Exhaust System.

Lexington's Double Exhaust

Chief Engineer Moore Invents New Method of Handling Exhaust to Eliminate Pressure.

THE Lexington-Howard Co., Connersville, Ind., in the 1917 models of the Lexington car are introducing the Moore multiple exhaust system as an exclusive feature. The system was patented Aug. 29, 1916, by John C. Moore,

average was 29.30 and the average room temperature was 78 degrees Fahrenheit. The water temperature at the outlet averaged 148 degrees Fahrenheit. Another remarkable result obtained by the system was the sustaining of the torque,



Six-Cylinder Engine Fitted with Moore System, Showing How Overlapping of Exhaust Strokes is Eliminated.

engineer of the Lexington Howard Co., after two years had been spent in a research to determine if his system was the first successful effort in the field.

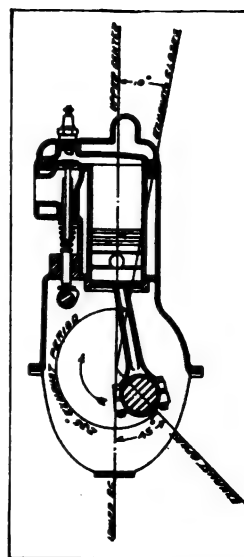
The fact that a single-cylinder engine of a given bore, stroke and piston speed gives five horsepower, while six cylinders of the same size give only about 25 horsepower, started Mr. Moore to find out where the lost horsepower went. He analyzed the exhaust problem and found a successful solution by employing two manifolds and two mufflers. On May 31, 1916, the multiple system was fitted to a Lexington-Continental six-cylinder engine, $3\frac{1}{4} \times 4\frac{1}{2}$, and with all other conditions equal the engine developed 22.8 per cent. more power at a reduced gasoline consumption per horsepower hour as compared with the old type of single exhaust. The inventor, however, makes a more modest claim for his system, fixing the increased power gained through its use on a multiple cylinder engine, at from 15 to 20 per cent.

The curves on the accompanying chart show the results of the test made of the Lexington $3\frac{1}{4} \times 4\frac{1}{2}$ six-cylinder engine, 224 cubic inches displacement, at the laboratories of Wheeler & Schebler, at Indianapolis, on May 31, 1916. The carburetor was set to idle at 200 revolutions per minute and was unchanged throughout all the tests. The ignition was advanced the same degrees for revolutions per minute in each test. The barometer

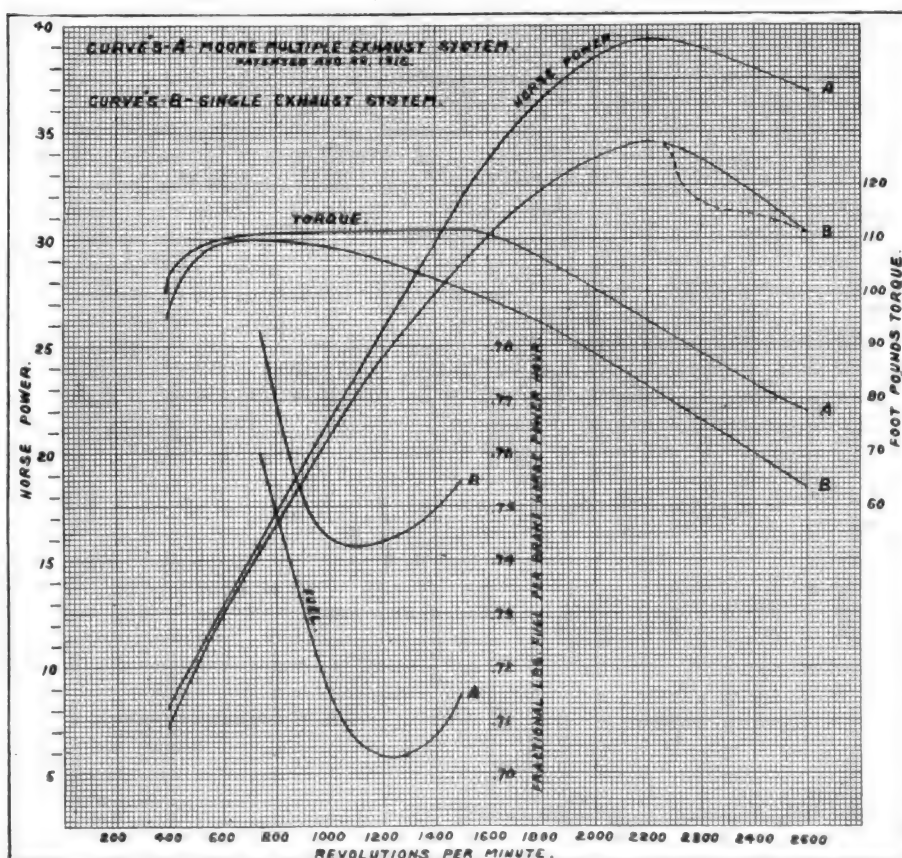
as by increasing the horsepower at low speeds the torque increased appreciably and at the same time was maintained over a range of from 600 to 1600 revolutions per minute.

The principle involved is very simple. As it requires nearly two-thirds of a revolution, 222 to 235 degrees, for each exhaust period, it is evident that the exhaust periods, in multiple-cylinder engines, must overlap, resulting in the exhaust from one cylinder being trapped by that of the next firing cylinder, causing some of the gasses to remain in the cylinder and prevent the intake of a full fresh mixture. For this reason the faster the engine is speeded up the less time is allowed for the exhaust, with an increase in trouble from improperly expelled gasses. All the cylinders must exhaust in turn in two revolutions of the crankshaft, making overlapping unavoidable.

As a natural result of eliminating the overlapping of the exhaust and incidentally avoiding the trapping of exhaust



Engine Section Showing Duration of Exhaust Period.



Results of Tests Made of Lexington Car with Moore Multiple Exhaust.

gasses, the power is not only increased and greater economy in fuel obtained, but the power developed is more efficient for hill climbing and pulling through bad roads. The effect upon the engine is to increase its flexibility, and free it from ignition troubles caused by carbon deposits.

Figure No. 2 illustrates the operation of the single exhaust system. As No. 5 starts to exhaust the exhaust stroke of No. 1 is hardly more than half completed and the gasses being expelled from the former are at much higher pressure than those being expelled from the latter, resulting in back pressure on No.

1 cylinder and resulting in incomplete exhaustion.

Other features of the new Lexington models include: Cut steel starting gear on flywheel; independent ignition, starting and lighting circuits; double universal joints on propeller shaft; wick feed oil cups; engine driven tire pump; double bulb, adjustable headlamps, rigidly mounted on radiator; largest size motometer; bolted on tire rack and spare demountable rim; oil pressure gauge; genuine leather upholstery; full weather stripped ventilating windshield; speedometer, electric horn, ammeter and portable electric lamp.

and Hudson counties, N. J., have already approved the plan and the Essex county board stood four to four on the question last summer, but will vote on it next month. Action of the three counties is necessary before the governor can appoint a commission with full powers to carry out the work.

HORSEPOWER RATINGS MAY BE ABANDONED.

As a result of the great variation in design resulting in a great variation between the actual horsepower and rated horsepower under the S. A. E. formula, some manufacturers of engines are disposed to abandon the horsepower unit for rating.

It is claimed that in using the same formula in rating all the different designs of engines, some are discriminated against.

The White Company, Cleveland, O., has discontinued the use of the horsepower rating with the introduction of its new 16 valve engine, claiming that so far as indicating its power, the horsepower rating is meaningless and should be abandoned.

The new White engine is of comparatively small size and therefore carries a low rating, yet it is one of the most powerful used in automobiles. It is contended therefore by the manufacturers that a new formula for rating power in gasoline engines is needed to overcome a wide discrepancy in the rated and actual power.

"USEFUL AUTOMOBILE INFORMATION" BOOKLET.

The Continental Insurance Co., 80 Maiden lane, New York City, has issued a little booklet entitled, "Useful Automobile Information," which contains much interesting and valuable advice on how to care for the different parts of a motor car.

COYOTE HUNTING IN KANSAS WITH AUTOS.

Coyote hunting with automobiles is the latest sport in Kansas and is said to be equally as hazardous as either polo or fox hunting. The machines are driven out on the prairies, through ravines and gulches, regardless of the rough surfaces encountered in many places. Bill Hann, John Hann, Irwin Seaman and William Warring of Larned, Kan., recently went out on a hunting trip with six grey hounds. They drove until a large coyote was sighted. The machines were speeded up to 40 miles an hour in places. As soon as the dogs sighted the running coyote they were unleashed. Regardless of the speed of the car the hounds would leap to the ground and set off after their prey.

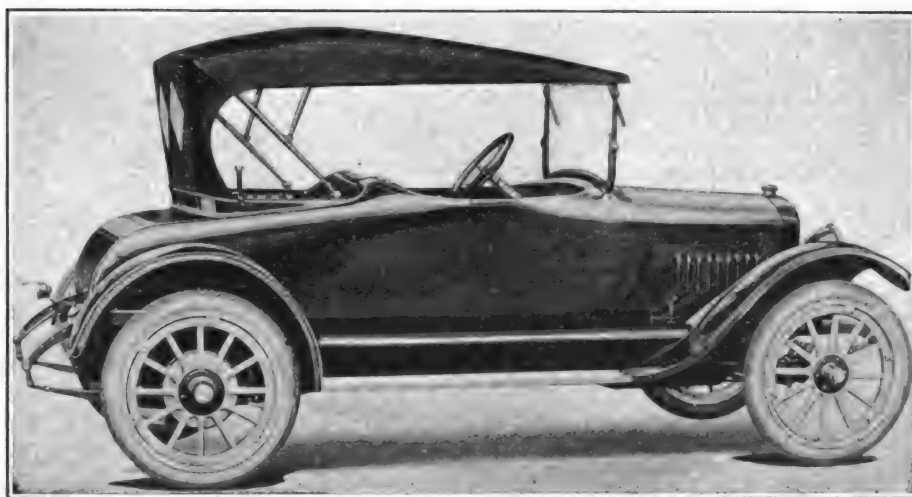
Sometimes the hunters are able to shoot the animals from the cars, but the dogs usually ran them down and did the killing.

Four Passenger Allen Classic

New Roadster Model Announced At New York Show is Finished in Classic Brown

A NEW four-passenger Classic roadster was announced by the Allen Motor Co., Fostoria, O., at the New York automobile show, the price being set at \$875. The new model

of genuine "Neverleak." In the back of the body is a roomy compartment, its cover opening from the rear, and in which the owner can carry luggage, tires and tools.



The New Four-Passenger Allen Classic Roadster.

is built on the standard Allen chassis, with a 37 horsepower, four-cylinder engine and 112-inch wheelbase, which makes possible a handsome and liberal sized body that easily accommodates four adult persons.

The attractive streamline body is finished in Classic brown, with Spanish brown upholstery, black radiator and fenders and cream colored wheels. The front seats are of the bucket type with an eight-inch passage way between. The rear seat is 38 inches wide, 20 inches deep and provides 16 inches leg room between the front of the rear seat and the back of the front seat.

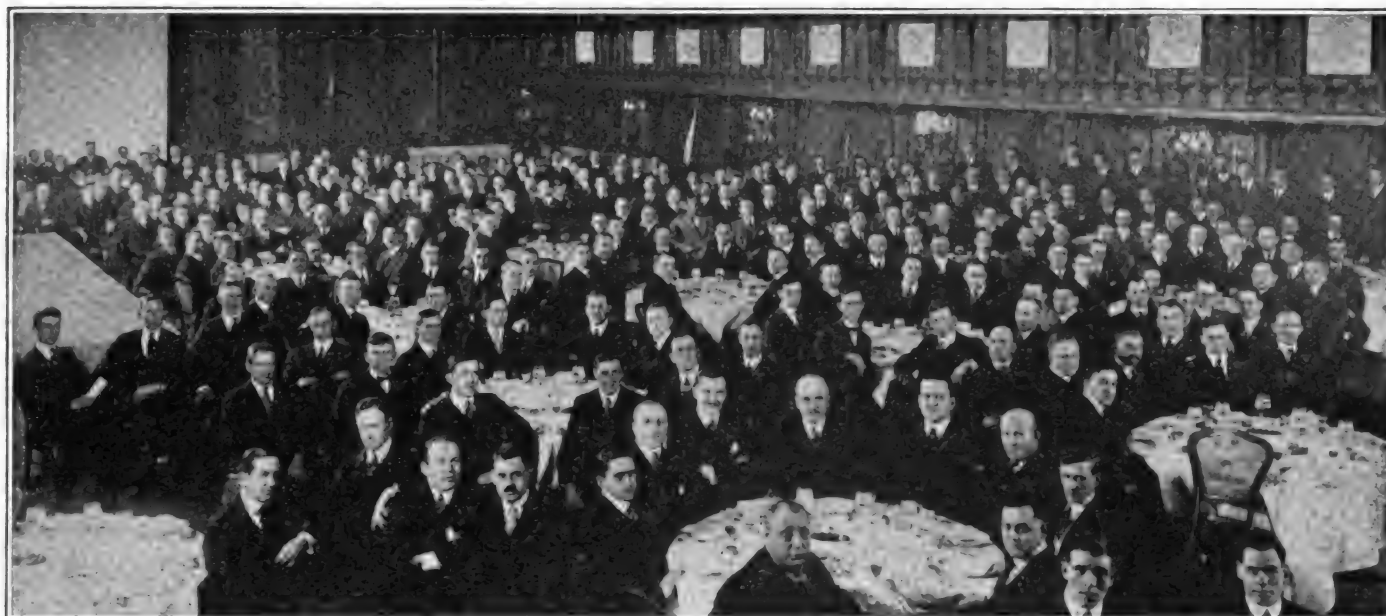
Features of the chassis are a full floating rear axle, 55-inch rear springs, Stewart vacuum gasoline feed from a tank in the rear of the frame, two-unit starting, lighting and ignition, full ventilating windshield, demountable rims and a top

TUNNEL FOR VEHICLE TRAFFIC UNDER HUDSON.

The New Jersey Interstate Bridge and Tunnel Commission has been granted a permit by the War Department to build a tube under the Hudson river for vehicle traffic between Jersey City and New York City.

It is understood that the tube will be run from the foot of Canal street in New York to Thirteenth street, Jersey City. Plans showing the definite location of the tube have not been filed, but the permit requires that the tunnel shall be located at least 50 feet below mean water. It is estimated that the cost would be \$11,000,000, of which amount New York state would bear one half. It would be built in two sections like the railroad tubes that now pass under the river.

The boards of freeholders of Bergen



The Men Behind the Hupmobile, Factory Representatives, Territorial Distributors and Salesmen of the Hupp Motor Car Corp., Detroit, Gathered at Luncheon in a Banquet Room of Hotel Biltmore, New York City, in Automobile Show Week.

The Business Side of the Motor Industry

The United States Rubber Co. is offering an issue of \$60,000,000 first and refunding mortgage five per cent. gold bonds series "A" at 96½ per cent. and accrued interest to date. Interest on the new bonds will be paid Jan. 1 and July 1 and all, but not part, of the issue outstanding may be redeemed on any interest date, on and after Jan. 1, 1920, upon 90 days notice at 105 and interest.

In the announcement of the issue the company showed total assets of \$124,613,606.61. The net earnings of the company and its subsidiary companies, available for interest for the fiscal year ending Dec. 31, 1916 (partly estimated), were \$12,500,000, as compared with \$11,539,313.10 in 1915.

The Hyatt Roller Bearing Co. has issued a neat little folder entitled "Scientific Service—a Sidelight on Hyatt Sales Methods," in which a brief description is given of the scientific manner employed by the Hyatt company in giving efficient bearing service for tractors, and how the Hyatt organization is trained to serve customers.

The Hood Tire Company, Watertown, Mass., manufacturers of Arrow Tread tires, is erecting additional factory buildings which will provide 80,000 square feet of floor space for manufacturing operations. The additions to the plant will make possible a production of 2000 tires daily. At present the factory is turning out 300 tires a day and the addition now nearing completion will allow for a production of 900 tires daily, but the plans call for four stories more on the foundations laid for the one-story extension, 64 feet wide. The new buildings are of massive structural steel bridge construction with concrete block walls and reinforced concrete floors. The expansion of the plant has been made

necessary by the enormous increase in the company's business, which last year was 400 per cent. more than during the year 1915.

The Baker R. & L. Company of Cleveland, O., makers of the Owen Magnetic cars, have announced an advance in price on both models, which went into effect Jan. 1. On the 125-inch wheelbase chassis, on which is built the coupe, touring car, limousine and landaulet, the price has been advanced \$125, and on the 136-inch wheelbase chassis, which is used for roadster, four and seven-passenger touring car bodies and limousine and landaulet, the price has been increased \$200.

The E. I. Du Pont De Nemours & Co. has made a road building film containing scenes taken from actual construction, which shows the improvement and conversion by the best and most modern methods of our worst roads into the various types of smooth, hard surfaced, easily traveled highways. The company will loan the film to responsible parties for the purpose of showing at meetings of all kinds having for their object the furtherance of the good roads movement.

The Eisenhuth Motor Co. has been organized in California to build the "Poppy Car," which will incorporate many new features according to the principal founder and promoter of the business, J. W. Eisenhuth. The engine has five cylinders and said to be able to start itself. The drive is direct to the rear axle by a newly patented gear which does away with the use of differentials and the transmission gearset. The motor will have but 79 parts, according to the inventor, as compared with about 225 parts in the average gasoline engine, and with the elimination of the many parts in the driving mechanism, 1202 parts that are

ordinarily found in the gasoline car have been abolished. The factory will be located at San Pedro on Los Angeles harbor on a site covering 250 acres. The "Poppy Car" will sell for \$650 f. o. b. Los Angeles.

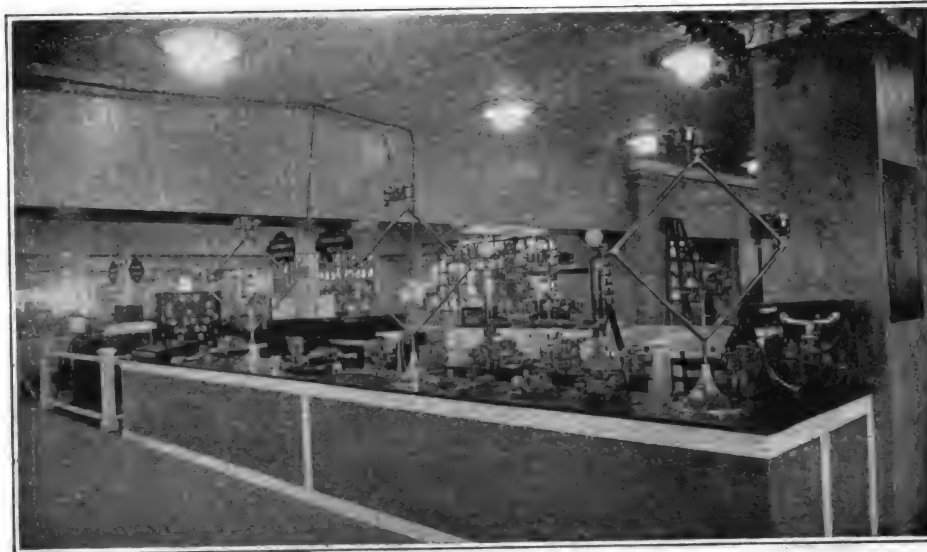
The General Engineering Co., Detroit, Mich., manufacturers of the Doble steam car, have secured a plant in that city which will be used for the production of the machine.

The Belmont Motor Car Co., Toledo, O., has been incorporated with a capital of \$125,000 and is planning the erection of a large factory in that city for the manufacture of a new car which was designed by Andrew A. Lehr, who is president and general manager of the company. B. F. Gantz is vice president and A. H. Miller secretary and treasurer. These officers, with A. T. Wilson and R. W. Beachler, make up the directorate.

The Day-Elder Motors Corp. of New Jersey has been formed with a capital of \$1,000,000 to take over the business and assets of the Day-Elder Motors Co. of Newark. The stock of the new company is divided into \$500,000 preferred and \$500,000 common. P. K. Hexter has been elected vice president, sales manager and director in the new company and has headquarters at 1457 Broadway, New York City. He was eastern sales manager of the Republic Motor Truck Company for several years.

The Chalmers Motor Car Co., Detroit, Mich., has announced an increase in the price of the five-passenger 6-30 and the two-passenger roadster, to become effective March 1. The 6-30, which sells for \$1090, will be priced at \$1250 and the roadster, which now sells for \$1070, will be priced at \$1250.

The Haynes Automobile Co., Kokomo, Ind., has announced a new price schedule



What Appealed Most to Visitors at the New York Show in the Rayfield Carburetor Exhibit Were the Demonstrations of the Simplicity of the Instruments, Their Automatic Control and the Unique Priming Device Mounted on the Steering Column or the Dash.

to become effective Feb. 1. Prices of models 36 and 40 will be advanced \$110 on that date and for models 37 and 41, \$140.

The Inter-State Motor Co., Muncie, Ind., recently announced the new price schedule, effective Jan. 1, as follows: TR roadster, \$875; five-passenger touring car, \$925; divided front seat model, \$940; five-passenger roadster, \$950.

The Mercer Automobile Co., Trenton, N. J., has announced a new series of cars to be known as the 22-73 models. The changes and improvements are largely confined to refinements in design and appointment, the lines following out closely the streamline effect of the previous series. The policy of adhering to the four-cylinder motor and concentrating on one type of chassis is also maintained.

The J. W. Leavitt Co., San Francisco, Cal., which is erecting a new building in that city with 45,000 square feet of floor space, will handle the Premier line on the Pacific Coast. The company, of which J. W. Leavitt is president, and A. D. Plughoff vice president, was formerly distributor of Overlands in that territory.

Montgomery, Ward & Co., Chicago, Ill., has purchased the factory of the Field-Brundage Co., Springfield, Ill., and will manufacture farm tractors.

The Carter-Long Magneto Co., Waukegan, Mich., which is planning the manufacture of a complete magneto and battery system, has increased its capital stock from \$50,000 to \$75,000.

The Ford Motor Co., Detroit, Mich., has over 55,000 employees in its factory and branches in the United States. Over 42,000 are working at the plant in Detroit. The total compares with 23,342, the number employed a year ago.

The Bower Roller Bearing Co. has declared a cash dividend of 15 per cent. and a stock dividend of 100 per cent., payable to stockholders of record of Jan. 18, 1917.

Robert C. Enos, advising president and

general manager of the American Distributing Co., Detroit, has been appointed sales manager of the Torbensen Axle Co., Cleveland, O., and will assume his new duties on Feb. 1.

The Victor Storage Battery Co., Rock Island, Ill., will increase its capital stock to \$100,000. At the meeting of stockholders which authorized the increase the following officers were elected: President, B. E. Winters; vice president, G. E. Brown; secretary, B. F. White; treasurer, T. D. White.

The Stromberg Motors Devices Company's New York City branch has been taken over by A. J. Picard & Co., and will be installed in the new Picard building when completed. F. E. Tucker, who has charge of the wholesale sales, will remain with the company, having headquarters in the Picard building.

The Standard Steel Tube Co., Toledo, O., has increased its capital stock from \$150,000 to \$600,000. The stockholders were asked to authorize the increase to provide additional working capital.

The Hamilton Motors Corp. is being organized and will be incorporated with \$500,000 capital stock to take over the Alter Motor Car Co., Plymouth, Mich. The new company will acquire a factory at Grand Haven, Mich., and will manufacture a car slightly larger than the present Alter model.

The Rubber Club of America at its annual meeting held in New York City on Jan. 8 re-elected the following officers: H. S. Firestone, president of the Firestone Tire and Rubber Co., president; Van H. Cartmell, Kelly-Springfield Tire Co., first vice president; H. Stuart Hotchkiss, United States Rubber Co., second vice president; H. S. Voorhis, secretary and treasurer.

At the annual banquet, which was held on the evening of the same day in the Waldorf-Astoria, over 650 members were present.

The Timken-Detroit Axle Company's directors have appointed the same board of officers for the ensuing year with the

exception of W. H. H. Hutton, Jr., director of purchases, who has resigned.

The Martin Truck and Body Co., which was recently incorporated under the laws of New York state with a capital of \$300,000, has taken over the Martin Carriage Works, York, Penn.

The Continental Motors Corp., with \$18,500,000 capital, will soon be incorporated under the laws of Virginia and will succeed the Continental Motors Co. of Detroit, although no change in ownership or management will result.

The stockholders of the latter company recently approved the action of the directors and practically all deposited their stock to be exchanged for the shares of the new concern when issued. The capital of the new company will be divided into \$3,500,000 preferred and \$15,000,000 common. Three shares of this new common stock and \$5 in cash will be given for each share of common stock in the present company. The present outstanding issue of \$50,000 preferred is to be retired and the new preferred stock will be offered through a syndicate.

It is understood that the action was taken to meet new capital requirements and that the output of the Continental plant will be doubled.

The Standard Parts Co., which was recently organized from a combine of the Perfection Spring Co. and the Standard Welding Co., has practically completed negotiations for the purchase of the Western Spring and Axle Co. This deal, when consummated, will make the Standard Parts Co. not only the largest producer of springs in the world, but also one of the leading producers of automobile parts of various description.

Negotiations for the sale have been pending several weeks and the stockholders of the Western Spring and Axle Co. have voted in approval of the sale, 72 per cent. favoring it. Work is now being carried on to consummate the deal, although it will be some time before all the details have been arranged.

The Western Spring and Axle Co. owns and controls the Armstrong plant at Flint, Mich.; the Hess-Pontiac plant at Canton, O.; the Hess Spring and Axle Co. at Carthage, O., and the Cleveland-Canton Spring Company at Canton, O.

The Duplex Motor Truck Co., which is at present manufacturing in a factory at Charlotte, Mich., has purchased 15 acres of land in Lansing, Mich., which will be used as a site for a new plant. It will be 800x60 feet and when the \$50,000 worth of machinery that is now in the Charlotte plant is installed, a production of 10 trucks a day will be possible.

The National Rubber Co., Pottstown, Penn., manufacturers of the Ebony Tread Speedway tire, is placing on the market a new type, called the Gray Tread Speedway tire, which is guaranteed for 5000 miles. Having a higher mileage guarantee than the Ebony it is priced slightly higher.

Philip W. Herzog, receiver for the bankrupt Twin City Motor Speedway Co., which owns the race course situated between Minneapolis and St. Paul, Minn.,

has sued Frank H. Wheeler of Indianapolis for \$240,000, which the receiver claims is due the company as the cost of 2400 shares of the company stocks which Wheeler subscribed for but for which he did not pay.

The Bock Bearing Co., Toledo, O., has completed the large addition to its factory which will make possible an increase of 400 per cent. in its output.

The Studebaker Corp., Detroit, Mich., has traded its Kansas City plant for the plant of the Staver Carriage Co. at Chicago. This exchange was effected so that the Studebaker Corp. could obtain an assembly plant outside of the congested freight zone.

The Titan Tire and Rubber Co., Inc., has been incorporated by Horace D. Newman, John J. Gray and J. Gerald Kenlon under the laws of New York state with an authorized capital of \$1,200,000. Headquarters will be at Batavia, N. Y.

The Firestone Tire and Rubber Co., Akron, O., is planning the erection of a four-story reinforced concrete structure on Woodward avenue in Detroit, Mich., to cost \$500,000.

The Universal Valveless Cycle Motor Co. has leased a 40-acre site in Muskegon, Mich., which will be used for the erection of a new factory. The company is now manufacturing engines at a plant in Toledo, O.

The Lewis Spring and Axle Co., Chelsea, Mich., has presented its employees with life insurance policies. Those who have been with the company for less than six months have been given a policy for \$500, which will be increased to \$1000 when they have been with the company one year. Employees having been with the company a full year were given policies for \$1000. The company pays the premiums on the policies as long as the employees remain.

Ben Goldberg, a New York newspaper man, has joined the advertising department of the Chevrolet Motor Co., New York City.

The Dominion Sales and Mfg. Co., which is to be incorporated with an authorized capital of \$250,000, will engage in the manufacture of a new puncture-proof pneumatic tire, the invention of Guy C. Hanna, who is to be president of the company. The company will be incorporated in Indiana and have headquarters at Indianapolis, but will transact business only in Canada.

S. W. Mills, for the past seven years engineer with F. I. A. T., Poughkeepsie, N. Y., has become associated with A. E. Schaaf of the Highway Tractor of Indianapolis, in developing the Parrett tractor.

Charles Johnson, formerly representative at Detroit of the Lovell-McConnell Mfg. Co., maker of Klaxon horns, has resigned and will hereafter act as general manufacturer's representative, with offices in the Dime Bank building in that city.

E. W. Davenport, export manager of the Maxwell Motor Co., Inc., Detroit, Mich., is on his way to Australia, where he will promote the foreign business of the company.



The Joseph Dixon Crucible Company's Exhibit Stood Out Prominently Among the Hundreds of Other Displays Because of the Cleverness of Arrangement of Ordinary Cans of Dixon Graphite Lubricants of Every Kind Suited to Use in Connection with Motor Vehicles.

Nelson T. Scott, formerly with the American Electrical Works, Pawtucket, R. I., has been appointed superintendent of traffic of the Kent Motors Corp., Newark, N. J.

The Taylor Mfg. Co., which formerly had a factory on Elmwood avenue, Detroit, has moved into a new plant at Redford, Mich., with double the amount of floor space. The company makes Taylor crankshaft pumps.

The Seiss Mfg. Co., Toledo, O., will move its manufacturing equipment into new factory buildings early in February and will double the working force. The company manufactures horns and lamps. The new factory faces on Lake Shore avenue and will provide additional floor space totaling 50,000 square feet.

Ivan F. Goodrich, general representative of the Globe Machine and Stamping Co., Cleveland, O., and who is president of the Goodrich-Lenhart Mfg. Co., Philadelphia, Penn., has also taken up the management of the sales department of the Philbrin-Brinton Co., Kennet Square, Penn.

H. O. Smith, president of the J. & D. Tire Co., Charlotte, N. C., which recently commenced production, announces that six sizes of tires will be the leaders, as follows: 30x3, 30x3½, 31x4, 33x4, 34x4 and 36x4½.

The J. & D. tires have a rich cream colored tread and circumferential depressions to increase the grip on the road. The tires are built to form, the various plies of fabric carrying the load strain equally at the point of inflation.

The company's plant is equipped with the very latest type of machinery and facilities and all the power machinery is electrically driven. The prices of the tires are slightly above the average.

James G. Roe, formerly connected with the sales and service department of the Hupp Motor Car Co., has become associated with E. A. Nelson, manufacturer of the new Nelson car. Mr. Roe will have charge of the sales department.

The Oakland Motor Car Co., Pontiac, Mich., has appointed W. R. Tracy to the position of assistant sales manager. Mr. Tracy has been connected with the Oakland selling force for over six years.

Otto Bruenauer, who has been with the Guerney Ball Bearing Co. for the past five years, has been appointed engineering manager of the U. S. Ball Bearing Mfg. Co., Chicago, Ill.

C. A. Bonniwell, who has been assistant sales and advertising manager of the Auburn Automobile Co., Auburn, Ind., has joined the H. Walton Heegstra, Inc., merchandising and advertising service, Chicago.

Alexander Winton, president of the Winton Co., Cleveland, O.; Thomas Henderson, vice president, and George H. Browne, secretary and treasurer, were re-elected to office on Jan. 15 at the annual meeting of the company. All three officials have served continuously in their respective capacities since the company was started, the meeting this year being the 21st annual.

The Sheldon Axle and Spring Co., Wilkesbarre, Penn., have taken out a license to manufacture axles under the Kardo patents, which cover both front and rear type designs. Litigation is at present pending in the courts over these patents.

The Chevrolet Motor Co., New York City, has increased the price of the four-cylinder model from \$490 to \$550. The company explains that the advance has been necessitated by the addition of the electric starter and the increased costs of labor and materials.

A. R. Griffin, formerly with the Studebaker Corp. and the Timken-Detroit Axle Co., has been appointed production manager of the Kellogg Mfg. Co., Rochester, N. Y.

Frank J. Hunt, formerly purchasing agent for the Weston-Mott Co., Flint, Mich., has been appointed purchasing agent for A. O. Smith Co., Milwaukee, Wis.



SLIPPERY CLUTCH PEDALS.

(Figure 297.)

Readers who experience trouble because the corrugations on the surfaces of the clutch and brake pedals have become worn smooth will find the suggestion offered here to be of much value. The reader submitting the idea was bothered in that way and contrived a means of overcoming the trouble satisfactorily. He retrieved an old pair of tennis shoes that had been discarded and cut off the heels, together with their uppers, and laced them on to the pedals in the manner shown in sketch. He punched several holes through that section of the heel containing the cloth and wove a strong lacing through the holes around the pedal in the manner shown in the illustration. At A is shown the arrangement of the holes and at B is shown the pad in position. While the pad may not be as attractive as those offered by specialty manufacturers, it has the merit of not requiring an outlay of money. Of course the tennis shoes should not be badly worn; in fact, a fairly good pair should be utilized.

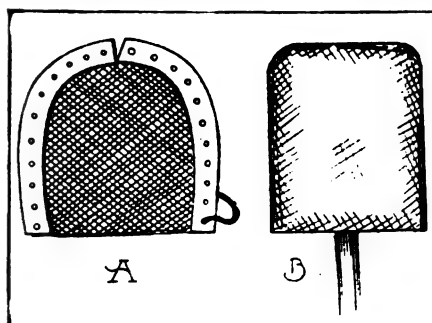


Fig. 297—Slippery Clutch Pedals.

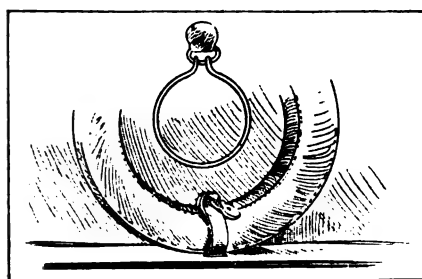


Fig. 298—Home-Made Tire Lock.

CARE OF WHEEL BEARINGS.

Owing to abnormal strains on wheel bearings in the winter time, due to the muddy and slippery conditions of the highways it is a good plan to frequently examine the bearings and locking devices. Any play should be adjusted, although care should be taken with ball bearings, as if they are screwed up too tight, excessive wear results.

HOME-MADE TIRE LOCK.

(Figure 298.)

In the accompanying sketch is a suggestion for a simple, easily made and economical tire lock that almost anyone can make and attach to his car. The materials required are a piece of springy brass strap, a flat staple and a small padlock. Measure carefully the distance around the tire and through the staple or loop under which the strap that is ordinarily used is buckled and also allow for turning up an inch of the ends of the strap. This will determine the length of the brass strap required. Drill holes in the ends of the band sufficiently large to pass the loop of the padlock. Slip the strap through the flat staple that is se-

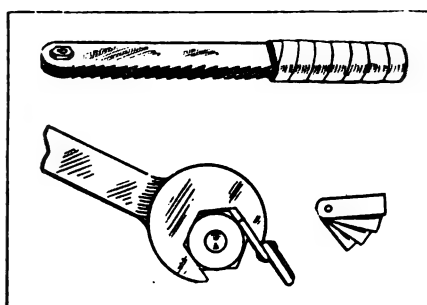


Fig. 299—Two Handy Tools.

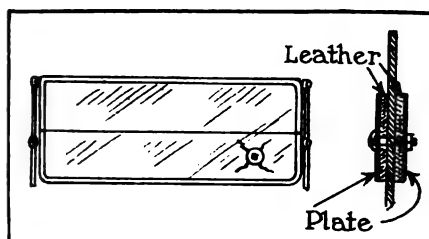


Fig. 300—Repairing Windshild.

cured in the running board and then turn up the ends of the brass piece with a pair of pliers so that the padlock can be snugly fitted. This gives a smooth band around the tire with no projecting points to wear the shoe and the tension will be sufficient to keep the lock from rattling. This device is preferable to a chain and lock and affords the same measure of protection.

A WRENCH "HANDY-BOY."

(Figure 299.)

The repair man who uses the device shown in the sketch called it his "Handy-Boy," and he seems so fond of it that he carries it in his pocket. The device consists of a number of pieces of an old band saw pivoted together on a rivet, and it is used to secure a tight fit on an odd size nut when there is no S wrench of the proper size at hand. Its method of use is clearly illustrated, one or more of the strips of metal being used as a packing, as shown.

HACKSAW BLADE RASP.

(Figure 299.)

A handy rasp can be made of discarded hacksaw blades in the manner suggested in the illustration at the top of the sketch. Such a tool is a very convenient device to have in the garage or on the road, especially in making repairs to an inner tube. The tool consists of simply bolting five or six old blades together at one end and covering the other end with friction tape to make a handle.

REPAIRING A WINDSHILD.

(Figure 300.)

A New Jersey reader repaired a cracked windshild in the manner described in the following: He cut out of a piece of old leather two discs of a size suitable for the purpose and drilled a hole in centre of each. Next he secured two metal discs the diameters of which were slightly less than those of the leather discs and bored holes in the centres of these to correspond to the holes in the leathers. Placing the discs on either side of the glass, with the leathers innermost, he inserted a small bolt and fastened with a nut. While the repair was not particularly conducive to fine appearance, it at least had the merit of being very practical and serviceable and gave every insurance of enduring for a long time.

WARM STEERING WHEELS.

(Figure 301.)

Many drivers complain of cold hands during the winter, although they wear heavy gloves. One of the reasons for this is that in gripping the wheel the circulation of the blood is more or less impeded. Some operators find that the old fashioned woolen mitten is the warmest covering to wear, but more or less difficulty is experienced in obtaining a firm grip because of the smoothness of the wheel. In the sketch is shown a method of wrapping the rim of the wheel with felt to provide a good surface for gripping with woolen gloves. To prevent the covering from slipping when on the wheel it is faced with friction tape on one side, the tape being sewed on and slightly less in width than the felt. The first step is to cut the felt into strips about $\frac{3}{4}$ inch wide and sew together as many as needed to cover the wheel. The tape is then stitched on and the rim of the wheel covered as outlined in sketch. The winds should be close together to provide smoothness and the two ends of the material sewed together. The tape will adhere firmly to the rim and the felt will not be as cold to the hands as the bare wooden rim. Another advantage will be that the covering will to a considerable degree absorb vibration and make long driving less tiresome.

HOW TO MAKE A SCREW JACK.

(Figure 302.)

While in a Massachusetts garage the other day the writer saw a workman using a small screw jack he had made himself. It answered the purposes for which it was designed very acceptably and was cheap and easy to make. The parts of which the jack was made can be found around almost any garage, they consisting of a piece of one-inch gas pipe about eight inches long, a $\frac{7}{8}$ inch bolt of the same length as the pipe, a strong washer, a half of a one-inch pipe flange and a strong nut to fit the bolt. The assembly consists of securing the pipe in the pipe flange, which will serve as the jack's base, and screwing the nut onto the bolt as far as it will go. As shown in the sketch the bolt is set in the pipe, the nut resting on a washer. To operate one only has to screw down on the nut, which will raise the bolt head and whatever is resting on it.

HOLDING SMOOTH SHAFTS.

(Figure 304.)

Holding or turning smooth round shafts is difficult. Utilizing a pipe wrench for the purpose is likely to result in damaging the metal, especially if considerable pressure is necessary to turn the shaft. Gripping it in a vise is not satisfactory because it will turn as soon as much leverage is applied. A simple method of turning such a shaft is illustrated in the sketch. It consists of winding a piece of strong rope around the end of a stick of wood and then around the shaft, either holding the ends of the rope in the hand or fastening to some convenient anchorage. If the wood is sufficiently long great leverage can be

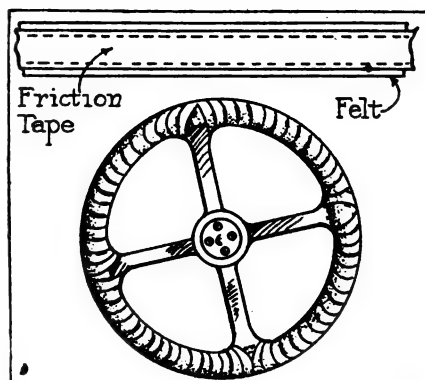


Fig. 301—Warm Steering Wheel.

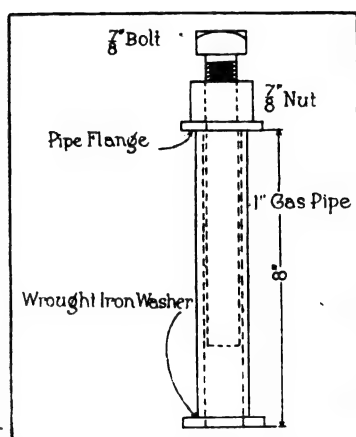


Fig. 302—Improvising Screw Jack.

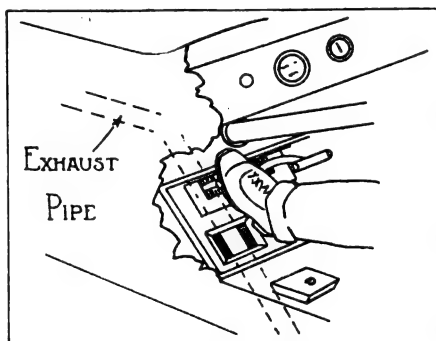


Fig. 303—Foot Warming Hint.

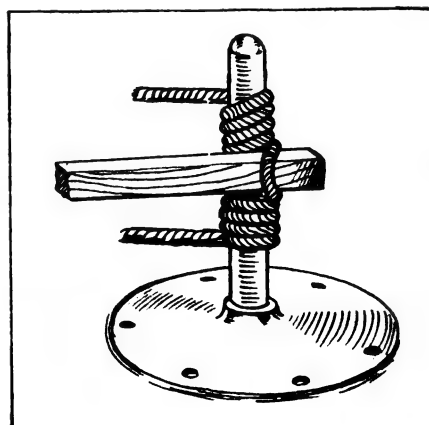


Fig. 304—Holding Smooth Shaft.

brought to bear and the most obstinate shaft will turn under the pressure and without danger of damaging its surface. However, if the shaft is unusually hard to start it is well to cover it with a layer of cloth or rubber to prevent possible abrasions.

KEEPING THE FEET WARM.

(Figure 303.)

In cold weather the driver of a car suffers from cold feet, a condition which it is almost impossible to overcome under general circumstances. If he resorts to the use of a blanket he is in danger of not being able to manipulate the pedals in a hurry. If he wears large overshoes then his feet become cumbersome and unwieldy. There is a simple way of keeping the extremities warm, as is pointed out by a resident of a country district who does considerable driving in the winter time. He has cut a small slot in the front floorboard, as shown in sketch, and through it the heat from the exhaust and the engine circulates around his feet. The sides of the flooring are sawed out on an angle so that it may be replaced quickly when desired.

To make canvas water proof wash it in a solution of dissolved soft soap and a small portion of sulphate of iron. When the canvas is dry coat with linseed oil. The soap prevents the oil from becoming hard.

If you place a piece of cloth under the point of a drill and drill through it you will be able to make quite a large hole at the first attempt without the drill slipping or chattering. This practise can be beneficially adapted for countersinking work when a clean finish is desired.

If you want to obtain a black finish on aluminum first polish it with a fine emery cloth, coat with a thin layer of olive oil and heat slowly over an alcohol flame. The heat causes the metal to turn brown and then black, depending, of course, on the degree of heat. To obtain a uniform color repeat the process. When the desired tone has been achieved, polish with a soft leather or a woolen cloth.

A reader advances the suggestion that the white of an egg is good for brightening the finish of leather upholstery. The egg should be thoroughly strained to remove any stringy matter and then should be applied with a soft cloth, giving a final rub with a dry cloth to remove all traces of the egg and bring out the lustre of the leather.

When you are tightening nuts bear in mind that a fine thread screw or nut requires less force than one having coarse threads.

You can obtain a fine grade of light oil by allowing several strips of sheet lead to remain in a quantity of olive oil for three or four weeks, keeping it in the sunlight as much as possible. The light oil will rise to top and can be drained off.

New Disco Electrical System

Two Unit Starting and Lighting System Is Large Enough for 4x5 Six Engine

A new type of two-unit starting and lighting system is being produced by the Disco Electric Starter Corp., Detroit, Mich., the systems being of the four-pole type. The machines measure approximately 7½ inches in length and five in diameter and are shaped cylindrically. The generator and the motor are constructed of the same parts, they differing only in the windings and armature laminations. They are wound for six volts only and weigh about 22 pounds.

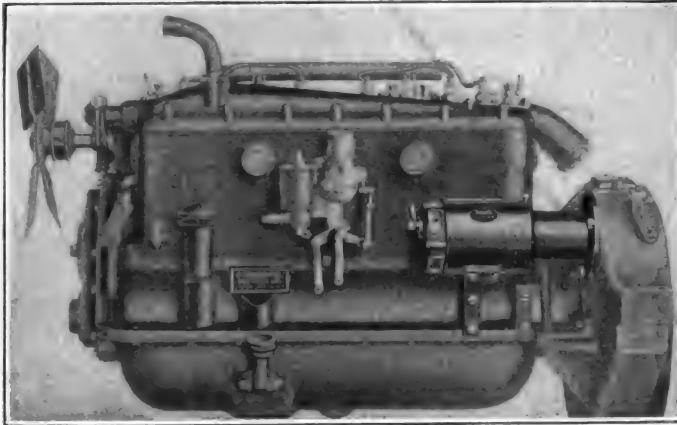
The capacity of the motor is sufficient for an engine as large as four by five six-cylinder types. Before entering upon production the company's engineers subjected machines to factory tests and found that no tendency toward sparking was evident in any speed up to 7500 revolutions per minute.

Regulation is by means of a Ward Leonard regulator or like device, so designed that it automatically lowers the charging rate when the battery is charged to capacity. Norma ball bearings are used on the generator, and there are oil cups for lubrication. Access to the mechanism of the starter

can be had by removing four long bolts.

HEAVY EXPENDITURES FOR NEW ENGLAND HIGHWAYS.

Statistics issued by the government



New Disco Electrical System on Continental Engine.

covering the expenditures for road improvements in the New England states for 1914, show increases over such expenditures in 1904 of 10 per cent. in Rhode Island to nearly 205 per cent. in Massachusetts.

The total expenditures in 1914 in New England were \$15,435,766.01, as compared with \$7,383,755.70 in 1904. The expenditures of each of the states in 1914 was as follows: Massachusetts, \$6,000,000; Connecticut, \$3,640,000; Maine, \$2,642,000; New Hampshire, \$1,590,000; Vermont, \$1,024,000; Rhode Island, \$446,500.

On Jan. 1, 1915, the surfaced roads of these states had an aggregate length of 18,036.78 miles, or 20.80 per cent. of the total road mileage, which was 86,718 miles. Nearly 10 per cent. of the improved roads in New England are bituminous macadam, 12 per cent. macadam, 23 per cent. concrete and .01 per cent. brick. Massachusetts had the greatest percentage of surfaced roads on Jan. 1, 1915, 45.53 per cent.

BAY STATE WOULD CREATE AUTO DEPARTMENT.

A bill has been filed in the Massachusetts Legislature at the request of Bay State motor associations, providing for the creation of an independent automobile department which will take over the control of motor vehicles from the Highway Department.

The bill would empower the governor to appoint a citizen of the state as vehicle commissioner for a three-year term at a salary of \$5000 a year, to have charge of all duties, powers and authority relating to motor vehicles that is now vested in the Highway Commission.

A similar bill was presented last year, but was voted down.

ELLIS SILENT MOTOR SHOWN AT CHICAGO SHOW.

The Ellis silent motor, manufactured by the Ellis Silent Motor Co., Detroit, Mich., will be on exhibition at the Chicago show. A number of business men of St. Joseph, Mich., are interested in the company.

CANTON AUTO PARTS COMPANY ORGANIZED.

A piston ring invented by Stewart Kurtz, 16 years old, will be manufactured by the Canton Auto Parts Co., Canton, O., which was recently organized with a capital of \$100,000. It is reported that 700 men will be employed.

TECHNICAL SCHOOL FOR AUTO DRAFTSMEN.

The fall term of the Technical School for Automobile Draftsmen and Mechanics, 20 West 44th street, New York City, which closed in December, was the most successful in the history of the institution. The attendance of the day class was nearly 100 per cent. and the evening class 87 per cent.

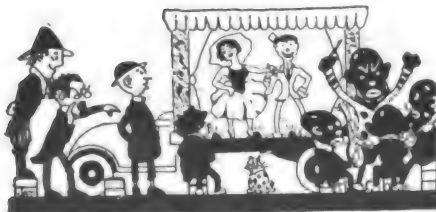
The winter term, which commenced Jan. 2, continues to April 11 inclusive. Inquiries regarding the courses, which include a correspondence course, should be directed to Andrew F. Johnson.

EXPERTS ISSUE PAPER ON PROPERTIES OF GASOLINE.

W. F. Rittman, W. A. Jacobs and E. W. Dean of the Bureau of Mines, U. S.

MOTORIZED VAUDEVILLE.

A traveling vaudeville show mounted on a motor truck recently passed through Platte and Clay counties in Missouri on a fellowship tour of the young men's division of the Commercial Club of Kansas City. The truck was a Kelly make and it was provided with all the fixings of a "small time" act. The sponsors even supplied an orchestra, consisting of three "gentlemen of color," who entertained the audiences with stringed instrument music. Two club members served as actors and their repertoire was said to have been quite extensive and fully satisfactory to the native Missourians.



COBBLING IN A FORD.

Even shoe repairers are feeling the pressure of the stiff competition evident in all branches of industry. One cobbler conceived the idea of beating out his competitors by equipping his Ford car with a complete cobbler's shop, including all necessary equipment, and carrying the shop on wheels to his customers in the remote districts. It is predicted that itinerant cobblers will soon be as common in the country districts as were the wandering umbrella and tin ware menders. It remains for some ingenious person to connect up a shoe sewing machine and other power tools with the engine in the car.



Department of the Interior, collaborated in the preparation of a technical paper, which has just been issued, and treats with the "Physical and Chemical Properties of Gasolines Sold Throughout the United States During the Calendar Year 1915."

In commenting on their findings the authors say: "The bulk of the results given in this report go to show that there are possibilities of wide variation in the properties of gasolines and that a product bearing this name cannot be defined as exactly as might be expected. However, by noting certain properties or relations between properties, it is possible to discover with some accuracy the source, method of production and possible utility of the products examined."

MAKES FRANCHISE RECOMMENDATIONS FOR NEW YORK.

Duncan MacInnes of the Department of Finance of New York City has made a special report to the Board of Estimate recommending that the Fifth Avenue Coach Co. be favored for additional motor 'bus routes on Washington Heights across Central Park and in other streets.

The city has been considering the franchise proposals of the different companies for over a year. The Fifth Avenue Coach Co. is recommended because of the cash guarantee it offers, according to the report, which was three times that offered by the New York Motor 'Bus Co.

The Inghram-Hatch Motor Corp., New York City, which has a factory on Staten Island, is manufacturing a car which incorporates many new and novel parts. A four-cylinder kerosene engine is used and power is transmitted through a friction drive. Wheels with spring spokes, air cushions and sectional tires are used.

CIRCUS ON WHEELS.

Again the railroads have had to yield to the versatile motor truck, the latest and most ambitious stunt in the matter of transportation being the adoption of motor trucks and pleasure cars to convey the tents, wild animals, actors and other appurtenances of a huge circus about the country. This spring the United States Million Circus Corp. is scheduled to leave New York City for a tour of the United States in a fleet of 130 specially built motor trucks and a flock of pleasure cars. No doubt Ford cars will have a place in the procession, and then the clowns will have a new channel for their humor and antics.



Record Sales Made in 1916

The Remarkable Field in Accessories, Etc., Demonstrated by a Two-Year Old Concern

Reporting sales six times greater during 1916 than in the preceding year, the manufacturer of Wonder-Mist, which is a cleansing and polishing liquid that is simply sprayed on a motor car, enters upon the second year of production as one of the most phenomenal successes



How Wonder-Mist is Applied to Cleanse and Polish Car's Finish.

in the automobile accessory field. Millions of cans are sold annually.

Wonder-Mist was conceived by a furniture dealer experienced in the actions of certain liquids on dirt and grease. As it is now produced, it is a blend of 14 fine grade oils and is sprayed on the exterior of the car. It penetrates the dirt and road tar that may have gathered, dissolving it and leaving a film of lubricant between the dirt and the finish to prevent scratching when rubbed with a dry cheese cloth.

Aside from its value as a cleansing and polishing agent, Wonder-Mist is also used on new cars to prevent mud spotting and rain streaking, and when putting away the car for any length of time to prevent the finish from becoming dull. It is made by the Wonder-Mist Co., 261 Franklin street, Boston, Mass., and is sold by almost every dealer.

NEW ELGIN PUBLICATION MAKES ITS INITIAL BOW.

The "Elgin Progress," the house organ of the Elgin Motor Car Corp., Chicago, has made its initial appearance in the trade. It is a bright and newsy publication, intended "to promote close co-operation among all those connected with the organization," according to Editor R. S. Marsh.

MASS. LICENSE PLATES ARE SEVERELY CRITICISED.

The Massachusetts number plates which have been recently adopted have met with severe criticism from many quarters. It is claimed that they are not only cheap looking, but are made of metal that is too thin to give service and are lettered poorly, both as to color and application, making it doubtful if the

numerals are legible at times when it should be easy for the eye to define them for identification purposes.

1917 EDITION "CORRECT LUBRICATION" IS ISSUED.

The Vacuum Oil Co. has published its 1917 edition of its booklet entitled "Correct Lubrication." It is a 56-page book, printed in two colors and contains such subjects as Methods of Lubrication; Engine Troubles, Their Causes and Remedies; Chassis Troubles, Their Causes and Remedies, and many other chapters of value to owners of any make of pleasure cars and motor trucks. Copies of the booklet can be obtained free of charge, either from the Vacuum Oil Co., 61 Broadway, New York City, or its branches throughout the country. The book is unique and valuable.

Australia has developed a bullet, nail and glass proof tire which gives good service on all kinds of motor vehicles where excessive speeds are not demanded. The tire goes under the name of "homing" and when it was first marketed was offered for use only in emergencies, but gradually came into general use for continuous service. Coil fiber is used in its construction and it is fixed to the rim with four or five straps. It takes the place of both the shoe and tube that are used in the complete rubber tire.

TEACHING THE NOVICE.

The ramifications of the Safety First idea are remarkable and commendable. A Brooklyn, N. Y., dealer in motor cars, C. M. Bishop by name, has conceived, constructed and patented a device whereby a new owner can learn the mysteries of operating a car without endangering everyone in his neighborhood. The car is anchored to the floor by means of the device, which duplicates all the conditions of driving, such as climbing hills, going through deep sand, negotiating curves and stopping abruptly. In this way a pupil receives a thorough education in every conceivable condition before he actually goes on the road.





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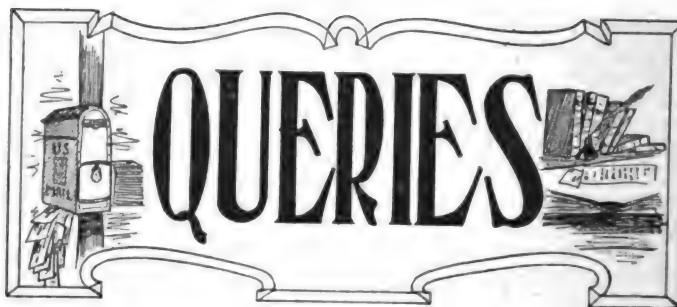
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NOTICE TO READERS.

THIS department contains the Mechanical Editor's answers to readers' inquiries. It is open to every subscriber. If any part of your car is not operating satisfactorily, or if you desire information regarding operating, maintaining or repairing motor cars, do not hesitate to lay your troubles before him. He will answer promptly and fully, either by mail or in these columns, as you direct. This service is free to every subscriber, and is often the means of saving considerable money that otherwise would be spent with a garage man. Letters should always be signed with the writer's full name and address, and the car or part in question should be properly identified, by mentioning the maker's name, model, year of production or other distinguishing feature. Address all inquiries to the Mechanical Editor.

HOW TO CALCULATE HORSEPOWER.

(W. E. L., Ballston, Va.)

Please give me the formula to determine the horsepower of a motor, S. A. E. or A. L. A. M.

In answer to your request for formulae for S. A. E. or A. L. A. M. rating, the formula given below covers both these ratings.

$$H. P. = \frac{D^2 N}{2.5}$$

In other words, the diameter of the pistons squared multiplied by the number of cylinders, divided by 2.5. Example: A four-cylinder engine has a bore of $2\frac{1}{2}$ inches.

$$H. P. = \frac{6.25 \times 4}{2.5} = 10.00 \text{ H. P.}$$

MEANING OF ELECTRICAL TERMS.

(J. S., Maple Lake, Minn.)

Will you please tell me the relationship and the formulas for volts, amperes, watts and ohms. Also tell me how many amperes my Robinson & Meyer motor generator takes, and how much current it generates. The motor is rated at 110 volts, the generator 250 watts, 30 volts.

A volt is the unit of electrical pressure. An ampere is the volume of electrical current. A watt is the unit of power. An ohm is the unit of resistance.

To illustrate the units and their relationship to each other the simile of the flow of water in a pipe is often used and easily understood. A certain size pipe allows five gallons of water (ampere) to flow through it per minute, at a pressure (volt) of two pounds per square inch. By connecting this pipe with a turbine it generates one horsepower (746 watts). You will, of course, understand that this pipe offers a certain amount of internal friction to the water flowing through it. This friction corresponds to the ohm.

The relationship between all of these units may be seen from the following two formulae:

$$C = \frac{E}{R} \quad W = C E$$

C represents the amperage, E the voltage, R the resistance, or ohms resistance, W the number of watts.

Taking for example your Robinson & Meyer motor-generator system. By using the second formula you say that the generator at 30 volts generates 250 watts; then $W = 250$;

$E = 30$ and therefore C must equal $8 \frac{1}{3}$ amperes; giving you the final unit of the generator.

Your motor uses 110 volts. Leaving out the friction loss and other complicated items entering into the conversion of current, it uses practically 250 watts of power to run the generator, in this case $W = 250$, $E = 110$. Therefore the amount of current or amperes will be equal to 2.272 amperes.

Given any two of the units, namely, volts, amperes or ohms, the third unit can be found from the first table given above.

One thousand watts are equal to one kilowatt.

WIRING OF DEACO DYNAMO.

(A. C., Troy, N. Y.)

What are the connections on a Deaco dynamo?

The Deaco dynamo may be either of the following types. The wiring of the cut-out switch is shown in each instance.

The permanent magnet type of Deaco dynamo is identified by six permanent field magnets of inverted U shape, around the opposite sides of which are wound two field coils.

The cut-out connections, of which there are three, are marked "Dyn+," "Bat+" and "Dyn-Bat-." The dynamo connections will be found on the end of the machine opposite the drive marked + and -. These connections are to be connected to the cut-out connections Dyn + or -, as marked.

The connections marked Bat+ and Bat- are connected to the battery connections bearing similar marks, through the lighting switch.

The round dynamo without permanent magnets finds its own polarity when connected with the battery, so that no marks will be found on the outside terminals. The cut-out for this type of dynamo is mounted on the dashboard. It has three terminals on top marked D+, which is connected with one pole of the dynamo; B+, which is connected through the lighting switch to the positive battery connection, and -DB, which connects with a line from the negative battery terminal to the other pole of the dynamo.

Any other information regarding this machine may be obtained by addressing the company, Detroit Electric Appliance Co., 264-68 Jefferson avenue, Detroit, Mich., telling them the serial number and the type.

DETERMINING MAGNETO SETTING.

(A. M., Syracuse, N. Y.)

How is the magneto or other setting determined on a car?

Relative to the above question let us divide the magnetos into two classes, the first class embracing those magnetos which are so arranged as to allow an advance or retardation of spark through a lever which may be adjusted by hand at any time by the operator to meet existing conditions. With this class of magnetos we will consider the so-called "timers;" the second class will consist of such magnetos as may have a set spark and once adjusted to furnish a spark in the spark plugs at a certain time cannot be changed.

From theory we learn that the proper time for the plugs to give the spark occurs just at the moment the piston starts on its downward path. If a good hot spark were to be furnished, and the mixture were a perfect one and exploded rather than burned, the practical time would be according to this theory. In practise we find that a motor running idle at a low speed will require such theoretical conditions as the motor speeds up. However, conditions of mixture, speed of current and mechanical changes demand that the spark take place in the plugs at a point where the pistons have not arrived at the top of the stroke; this point of course may differ in different makes of engines.


Now for the application of this theory to the first class of magnetos. With the spark retarded the breaker box should be set so as to snap open just as the piston has started on its down stroke. Thus it will be seen the engine may be turned over and cannot kick. As the engine speeds up the spark lever may be advanced to such a point as to cause the breaker box to break considerably before the piston reaches the top of its stroke. What has been said of the breaker box

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may also be said of the timer; only in the case of roller timers, etc., the contact must occur at the time the piston starts on its downward path.

As a rule magnetos falling under the second class give a strong, hot spark and do not need a variable setting to increase their efficiency.

The practical setting of such a magneto naturally varies with different makes of engines. It must be set so as to give a spark if possible before the piston reaches the top of its stroke. At the same time, however, if this spark occurs too early the engine will run backwards instead of forwards, or, as the phrasing is, kick. In practise the engine will give power, start without kicking and run idle with the spark at dead centre; that is at the extreme top of the stroke.

As an engine is designed to run, so will the cam gears be set to give the best service. By meshing these gears differently it will be found that the magneto breaker box snaps open either at the top of the stroke of the piston, slightly after, or a long distance ahead of the stroke. If such a choice were offered the gears should in all cases be so meshed as to bring the snap nearest the top of the stroke of the piston.

If you will follow the above advice, which covers practically all types of magneto and timer settings, you will experience no trouble or loss of power.

HOW TO CONNECT "OLD SOL" SPOTLIGHT.

(W. E. O., Hartford, Conn.)

Where shall I connect an "Old Sol" spotlight and what is the significance of the different colors at the terminals?

The green lead should be a grounded wire and should be bolted to the frame, at any convenient point; the white lead should be connected to the direct wire which connects the generator with the battery.

LOSES POWER ON HIGH SPEEDS.

(J. R. B., Detroit, Mich.)

My 1½ truck, equipped with type B Stromberg carburetor and Eisemann G-4 magneto, loses power on high speed, but seems to pick up all right when running idle. The compression and valves are all right. Do you think the spray nozzle is too small? What is the matter?

Your trouble may arise from a number of reasons, though at first it would seem to be caused by late ignition, rather than early ignition as you suggest.

Try setting ahead the timer gear, so that with the spark retarded, the spark in the plugs will occur just over the downward stroke of the piston. In this position the timer can be advanced so that the spark can be made to occur on the up stroke of the piston.

An obstruction in the carburetor feed pipe, dirt in the carburetor itself, or a piece of waste or lint in the needle valve, would prevent the proper supply of gasoline on the higher speeds.

See that your intake manifold is securely fastened to the engine so that there are no leaks around the joints.

It is hardly probable that the spray nozzle is too small.

A TROUBLESOME MAGNETO.

(D. B., Philadelphia, Penn.)

My motor misfires and seems to have no power when running on the magneto in high speed at about 10 miles per hour. When it is speeded up, however, everything seems to be all right. Can you tell me the reason for this?

The condition you mention is undoubtedly due to improper adjustment of the points at the breaker box of the magneto or at the spark plugs. The gap between the points on the spark plugs should not exceed 1/64 inch, while the distance between the points on the breaker arm and cam should be adjusted somewhat nearer together, depending wholly upon the make of magneto used.

When the magneto is turning at low speed the current generated is not sufficiently strong to leap a gap between

the plug points that it might overcome if the magneto were driven faster.

Your trouble may be due to defective mixture if the ignition system is right; for instance, the carburetor may be out of adjustment and too much air is admitted at low speeds. There may be a leak at the inlet manifold joints. It is a good rule to make it a point of replacing copper gaskets at this point every time the manifold is removed from the engine. In replacing, use plenty of orange shellac on intake manifold gaskets.

The valves may leak around the stems and so admit a certain amount of air at every intake stroke of the piston.

Be sure that the spark plugs are set uniformly as regards firing points and that all wiring is in good condition and connecting tight.

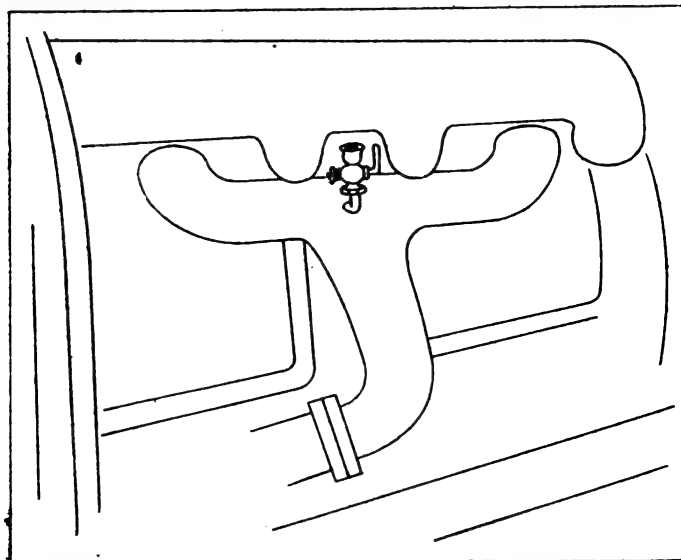
HAS DIFFICULTY IN STARTING CAR.

(J. B. A., Brattleboro, Vt.)

I use my car all winter, but find it very hard to start in the morning. Is there any remedy for this?

During this season of the year we are constantly being asked for methods of starting the engine.

Usually engines start much harder in cold weather because it is difficult to get a good mixture in the cylinders. Even if the carburetor is of the best and does its duty and furnishes a properly vaporized gas to the manifold, this gas may never reach the cylinder as a gas mixture. The low temperature of the manifold is very apt to cause condensa-



Suggestion for Facilitating the Starting of an Engine in Cold Weather.

tion of this vapor, which, forming in drops, will again return to the carburetor. After a time the drops on the manifold will begin to accumulate and give off vapor, which will eventually reach the cylinders.

No one, however, cares to crank a car until this condition is reached. The accompanying sketch will show an easy method of priming the engine through the manifold and may be used on such cars as do not have priming cups on the cylinders. Any plumber can tap a $\frac{1}{8}$ " hole in the intake manifold at the joint and insert an L priming cup as shown.

Perhaps just a word concerning priming would help at this point. The chemical called "sulphuric ether" will be found to be an excellent primer for cold weather. Ether should be used very sparingly, however, and the container should be carefully kept away from fire. Its flash point is far below that of gasoline. Make it a rule to use it only when absolutely necessary.

VALVE GRINDING HINTS.

(J. R. S., Pittsburg, Penn.)

Will you please tell me something about grinding valves. How to go to work on the job, what to look out for and any hints that I can use in the work? My car is nearly new, but all my friends tell me that the valves need grinding.

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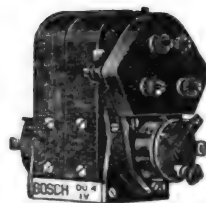
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Ask your dealer for NON-FLUID OIL. Sold only in orange colored cans. "K-00 Special" grade is for gears; "K-000" for bearings.

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"SUPERIOR" or a "COSY" Safe Garage Heater

All air taken from outside building.
No gasoline fumes can enter heater.

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Automobile Oils

27 STATE STREET BOSTON, MASS.

When to grind is the first thing to learn. The symptoms of necessity for valve grinding may be noted in a variable missing of the cylinders, when ignition and carburetion are in correct adjustment. Another is a loss of power under loads and on grades. It will also be detected by a peculiar hissing sound during the exhaust stroke, and at times during the compression stroke. This means that the gas under pressure is leaking through the valve seat.

The time to grind, according to the opinion of many experienced drivers, should be determined by the mileage covered. From 3000 to 5000 miles is about the average, the distance of course varying with the care the motor has had. Unless you have done lots of driving or have used too much cylinder oil with the new engine, your valves should not need grinding out.

First the valves should be marked in such a manner that they may be returned to their original places. Make a somewhat wet paste of very fine emery and oil, or use a ready prepared paste which may be purchased at any supply store or repair shop. Apply a small amount of this to your valve seats and set the valve back into place on top of this. Then with a screw driver set into the slot in the valve, rotate it about 45 degrees first to the right, then to the left. Lift the valve off of its seat after doing this for a short time, say after a dozen turns, and turn it around through 90 degrees, so that a different part of the valve will bear on each part of the seat.

Then repeat the turning, pressing on the screw driver just enough to hold the valve down onto the emery so as to make the latter cut both valve and seat. After a time, as before, lift off the valve and turn through another quarter turn, continuing until it has made the circle.

This is the process of grinding and the only things to avoid are: Don't bear on too heavy, so as to cut in deeply; don't grind so long as to cut into the seat too deeply; don't use too much emery or a coarse grade; don't grind in valves until you are sure it is necessary. Above all, keep the emery away from every other part of the engine.

After grinding operation use the utmost care to have all emery removed from every part of the engine, examining the valve guides, the pockets around the seats, the tops of the pistons and all holes where the emery may have fallen or lodged.

Bear in mind that the emery in the engine will scratch and score every bearing surface that it touches, just as it did the valve seats.

PAINT ON METAL PARTS.

(J. L. R., Troy, N. Y.)

Is it possible for me to paint directly on the metal parts of my car and have the paint remain and not peel off? I want your answer to apply principally to the heated parts, such as the radiator and lamps.

There are a number of paints on the market, and preparations of different standard colors that you may use for this. The following will, however, give you a satisfactory result: Paint directly applied to smooth brass parts will not endure long if it is subjected to heat, which is in a degree true of iron parts. However, a very thin coat of shellac as a foundation will not peel off under ordinary radiator conditions. Such a base will withstand even boiling water. Paint can be applied directly to the foundation of shellac. By mixing a small amount of the coloring matter with the shellac a quicker result will be obtained with fewer coats of paint. Be sure that the shellac is dry before applying the paint.

PICRIC ACID IN AN ENGINE.

(C. J. W., Louisville, Ky.)

Will you please tell me what effects picric acid will have on my automobile engine? Some of my friends say that I will get a great deal more power by using this acid in my gasoline.

Picric acid is a yellowish powder and is a constituent of high explosives. It has a decided corrosive action upon the metals of the engines in which it is used, pitting valves and seats and attacking the cylinder walls.

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When used in the proper proportions it will increase the explosive force of the fuel, but it is not to be recommended for use on cars of conventional construction, as it may produce stresses in the parts that are not capable of resisting.

As an illustration of this, consider what would happen if a shot gun were loaded with gun cotton and fired. The gun would burst from a pressure exceeding that for which it was designed. To a certain extent this illustration may be applied to an engine using picric acid combination as a fuel.

It is said, however, that 5 to 10 per cent. more speed has been obtained by using one ounce of picric acid and two ounces of sal ammoniac to every five gallons of gasoline. The powder is dissolved in a quart of the fuel and then added to the five gallons.

If you value your engine don't try the experiment.

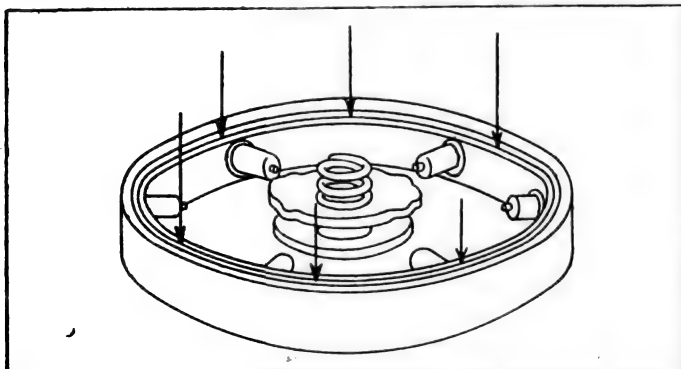
SPRINGS UNDER CLUTCH LEATHER.

(W. B. O., Seekonk, Mass.)

Some time ago you published an article telling how to put springs under a clutch leather to prevent harsh engaging of clutch. Can you tell me when it was printed?

We do not find that we published such an article as you mention. You will find, however, that a device such as the following will answer the purpose.

Cut from four to six pieces of hard rubber about $\frac{1}{8}$ " thick, $\frac{1}{4}$ " wide and 1" long and insert them around the rim, between the leather facing and the cone as shown by the arrows on the sketch. If the clutch has compensating plungers, as



Illustrating Where to Insert Rubbers Under Clutch Leather.

shown, the rubber should be inserted about half way between each of the plungers.

HAS CARBURETOR TROUBLE?

(A. J., Rochester, N. Y.)

In examining my carburetor recently to learn the reason for flooding I found that the float was filled with liquid and did not seem to be light enough.

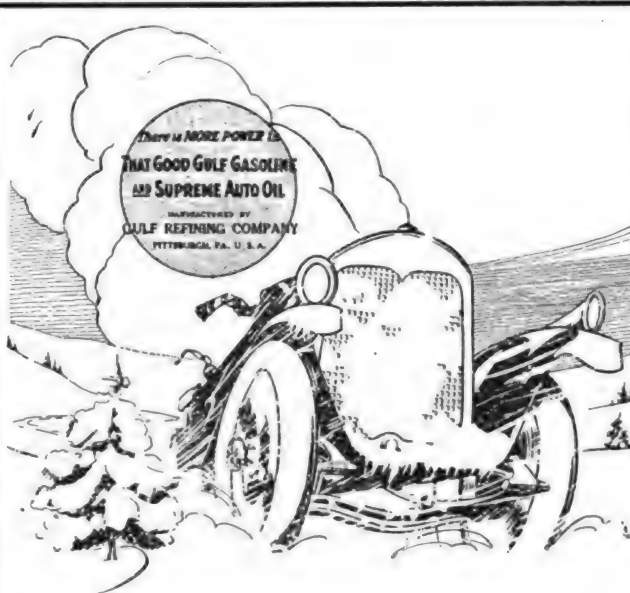
Carburetors may be made with two kinds of floats, cork and metal; you do not state which type you have.

If the cork type, the cork portion should be detached from the valve and placed in an oven, care being used that the oven is not so hot as to burn the float. Inspection will show when the moisture is driven out of it. As soon as this occurs the cork should be given a number of coats of shellac to prevent it soaking up the gasoline again and thoroughly dried and replaced.

Liquid in the metal type of float may be expelled by placing same in boiling water, taking care that the opening through which the fuel entered is at the top, and above the surface. The heat will vaporize the liquid and it will escape in the form of a gas. The hole may be slightly enlarged to facilitate emptying the float, and afterward sealed with a drop of solder. In all cases remember that the liquid in the float is gasoline and that precautions should be taken so that a flame does not ignite the gas given off.

You will probably have a little trouble when you return the float to establish the proper gasoline level adjustment in the float chamber. It is well to note here that the level of

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Supreme Auto Oil

Flows Freely at Zero. Starts With the Engine.

This is most important during the winter months. You should know whether the oil you are using "flows freely at zero." All oils do not possess this feature—notably the paraffine base oils, which thicken up under cold and often cause great damage to the motor.

The safe way is to ask for SUPREME AUTO OIL—it "Flows Freely at Zero" and leaves less carbon, owing to the fact that it is a Southern Asphalt-base oil containing no paraffine to gum, stick or thicken.

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Series TR4—Four Passenger Roadster.
Series TC—850 lb. Delivery Wagon.

Inter-State Motor Co., Muncie, Ind.



**NEW DEPARTURE
BALL BEARINGS**

American Made
FOR
American Trade
QUALITY
FIRST

THE NEW DEPARTURE
MANUFACTURING CO.
CONRAD PATENTS LICENSEE
BRISTOL, CONN., U.S.A.

BRISCOE
"A line of three leaders."
 Briscoe Twenty-four, \$625, electric starting and lighting;
 full equipment.
 Briscoe De Luxe Eight 38, \$985; Four 38, \$785.
 Write or wire.
BRISCOE MOTOR CORPORATION, 157 Leroy Ave., Jackson, Mich.

Regal-4-thirty-two
THE BIGGEST CAR IN THE LIGHTWEIGHT CLASS
\$745.00
REGAL MOTOR CAR CO. - DETROIT, MICHIGAN

Allen \$850
r. o. b. factory
MOTOR CARS
THE ALLEN MOTOR CO. FOSTORIA, O.

OLD SOL
NITROJECTOR No 100
 THE 1905 PERFECT SPOTLIGHT
 Hawthorne Mfg. Co., Inc., Bridgeport, Conn., U.S.A.
 MAKERS OF OLD SOL WINDSHIELD SPOT-
 LIGHTS AND ELECTRIC LIGHTING DEVICES

A NEW PACKAGE
 You can now obtain from your dealer a new
 package of
DIXON'S Non-Leak Grease No. 680
 put up in 2½ lb. cans for Ford differ-
 entials. Dixon's Non-Leak Grease No.
 680 "stays put!"
 Send for booklet 210 G.
 Made in Jersey City, N. J. by the
JOSEPH DIXON CRUCIBLE COMPANY
ESTABLISHED 1827

DIXON'S
 GRAPHITE
 Automobile
LUBRICANTS

Subscribe to
THE ACCESSORY AND
GARAGE JOURNAL
PUBLISHED MONTHLY
Times Building Pawtucket, R. I.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

gasoline in the float chamber should come to within 3/32 or 1/4 inch of the top of the needle jet.

BROKEN GEAR TEETH.

(E. A. M., Boston, Mass.)

Two of the teeth on the iron gear which drives the pump on my air compressor are broken. The teeth are on opposite sides of the gear and I thought that you might be able to tell me of some easy way of repairing these teeth, as I do not want to buy a whole new gear if I can help it.

By using a little patience and care you will be able to replace these teeth. As they are not together the strain need not all be taken by one of the repaired teeth, and so the problem is greatly simplified. Do not smooth off the broken tops of the teeth, but leave as much of the broken part as is possible to assist the repair. The sides of the broken teeth should be smoothed over, however, so as to conform with the general shape or "cut" of the other teeth.

Along the top of the broken teeth, that is, across the face of the gear, bore a number of small holes, the size of the holes to be determined by the width of the top of the gear teeth. Tap out these holes and insert machine screws. Cut off the heads and file to conform with the general shape of the original tooth. Be careful not to bore too many holes in the rim so as to greatly weaken it.

Although the replaced tooth will look rough, it will turn the gear past the break. It may last as long as the rest of the teeth and if carefully fitted to the gear with which it is to run will go fairly smoothly.

SCRAPING IN BEARINGS.

(H. A., Bangor, Me.)

Will you please tell me through the columns of your paper how to scrape in bearings on connecting rods, and how to use the "shims" in connection with them.

In order to get the best results from bearings it is customary to scrape the high spots off and in general to give a larger and more even bearing surface.

Before starting, wipe all parts clean with a piece of waste. Apply an even coating of Prussian blue (a blue paste, which may be purchased from an automobile supply house, put up in tube form) to the crankshaft or journal of bearing to be scraped in. Now screw connecting rod down upon crankshaft journal, using two or three shims of varying thickness and taking care to build up shims evenly on both sides of split if cap happens to be open on both sides.

Swing the connecting rod back and forth once or twice, remove and note the high spots which will be apparent, because covered by the Prussian blue. Carefully scrape off a small portion of the bearing metal thus indicated with a scraper (never use a file or emery cloth) and go through the same procedure again until the Prussian blue scrapes off onto bearing practically at all points.

Bearings carefully scraped in after this manner should last much longer than bearings simply tightened into place. New bearings should always be scraped in.

RADIATOR STEAMS IN WINTER.

(A. J. M., Jersey City, N. J.)

Why is it that my radiator steams much quicker in the winter than in the summer? I am using plenty of anti-freezing solution. I did not have this trouble until I began to use this solution. But I am told that my engine will freeze up unless I do use it.

Your trouble evidently arises from the fact that in your endeavor to use plenty of the anti-freezing solution you have used too much of it. Use a greater amount of water in proportion to the amount of solution used. If you have been using alcohol as an anti-freezing solution use some other element instead. Try changing to some other solution, being sure to mix it according to the standard formulas.

ZENITH



CARBURETOR

Famous the world over for its great simplicity and uniform results. This leading exponent of the plain tube idea in carburetion means final freedom from trouble and adjustments. It is used by many of the best. Try it.

Zenith Carburetor Co.
DETROIT, MICH.

RFM



WARNING to Motorists

The Standard Oil Company of New York produces only one regular grade of gasoline for motor cars—SOCONY Motor Gasoline.

Some dealers and garage men are selling poor blends and worthless mixtures under misleading names, trying to make the motorist believe he is getting our well-known product.

Do not let them deceive you. If you want the genuine, reliable SOCONY Gasoline, look for the RED, WHITE and BLUE SOCONY sign on service stations and garages.

This sign is the guarantee of quality, purity and reliability. It insures maximum power and miles per gallon, clean burning and freedom from carbon troubles.

Ask for SOCONY gasoline by name and buy only where you see the RED, WHITE and BLUE SOCONY sign.

STANDARD OIL CO. of NEW YORK

AUTOMOBILE JOURNAL

10 cents the copy

PAWTUCKET, R. I.

\$1.50 the year

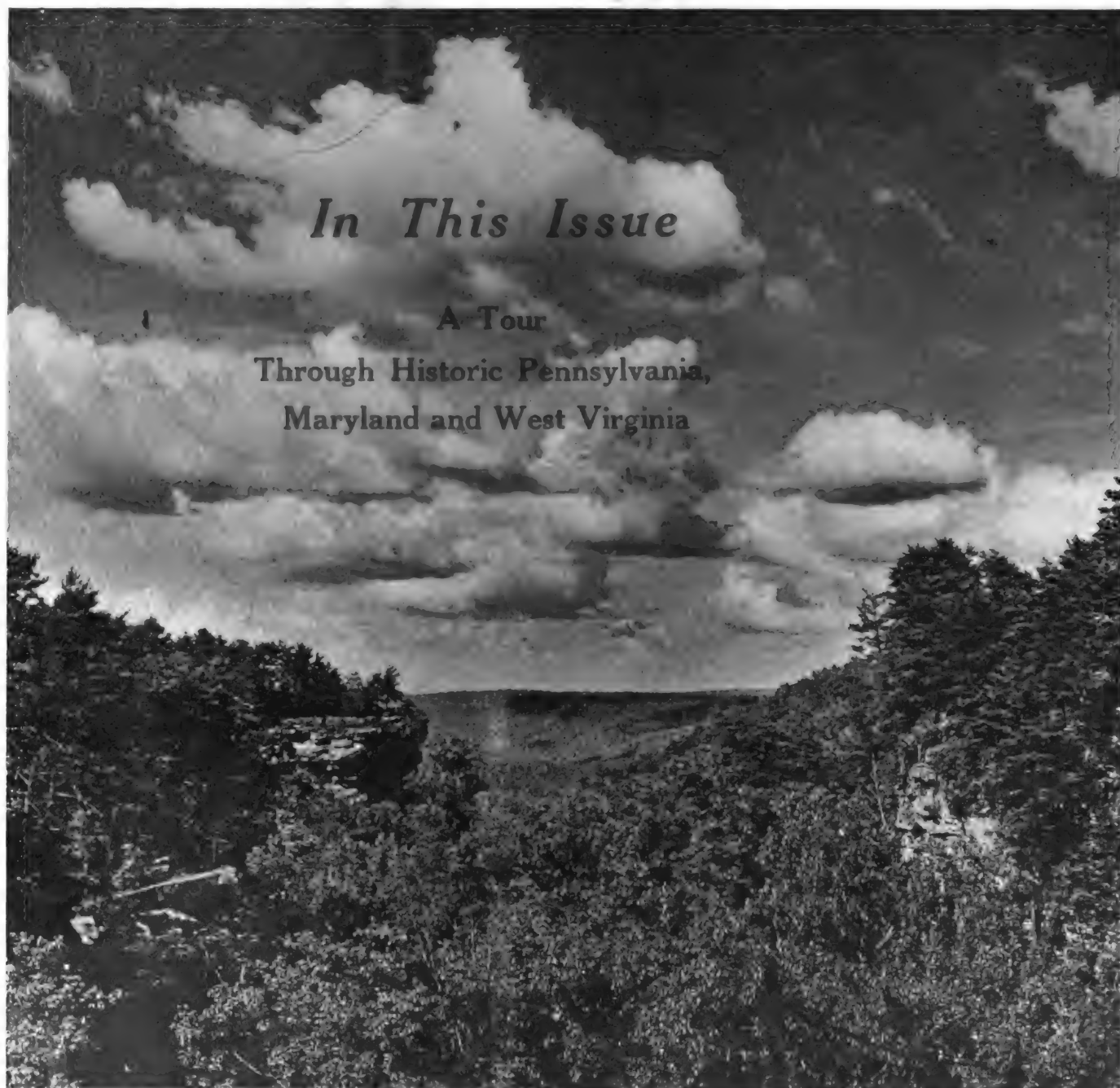
VOL. XLII.

AUGUST 25, 1916

NO. 2

In This Issue

A Tour
Through Historic Pennsylvania,
Maryland and West Virginia

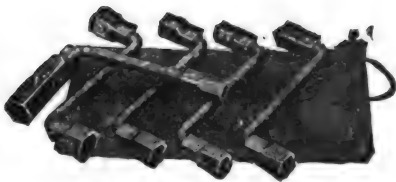


Nearly a Million FORDS on the Road

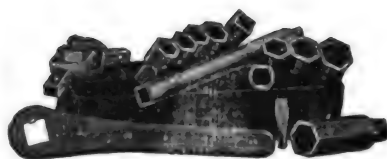
Help KEEP them on the Road by Using

MOSSBERG WRENCHES

And Special Tools for FORDS



No. 17 Set—Heavy duty for Ford. 10 sockets, including those special sockets for spark plug, rear axle housing and cylinder head nuts. Price each, \$2.00.



No. 30 "Ideal" Set for Fords. 10 sockets, including all special sizes. Ratchet handle, universal joint and extension bar. Price each, \$4.00.



No. 15 "Major" Set—Covers all adjustments on Fords, including reversible ratchet handle. Price each, \$5.00



No. 33 Set—A small, forceful set for packing under the seat. Five special sockets and double-end offset handle. Price each, \$1.10.

This

Means



Actual

Insurance

If your dealer cannot supply you we will ship prepaid on receipt of price.



Specially designed for Fords. Engineers' wrenches. 5 wrenches, 10 openings.

Your copy of complete Mossberg Tool Book No. 181A if you will send address.



No. 645, Reverse and Brake Pedal Tension Spring Wrench. The only practical wrench for this work. Each, 50c.



660 Wheel Puller. Indestructible and efficient. Each, 50c.



Combining all the special wrenches that help the smooth running of your car. Price, \$1.20.

FRANK MOSSBERG CO.

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Ewing-Lewis Co., Los Angeles, Cal.

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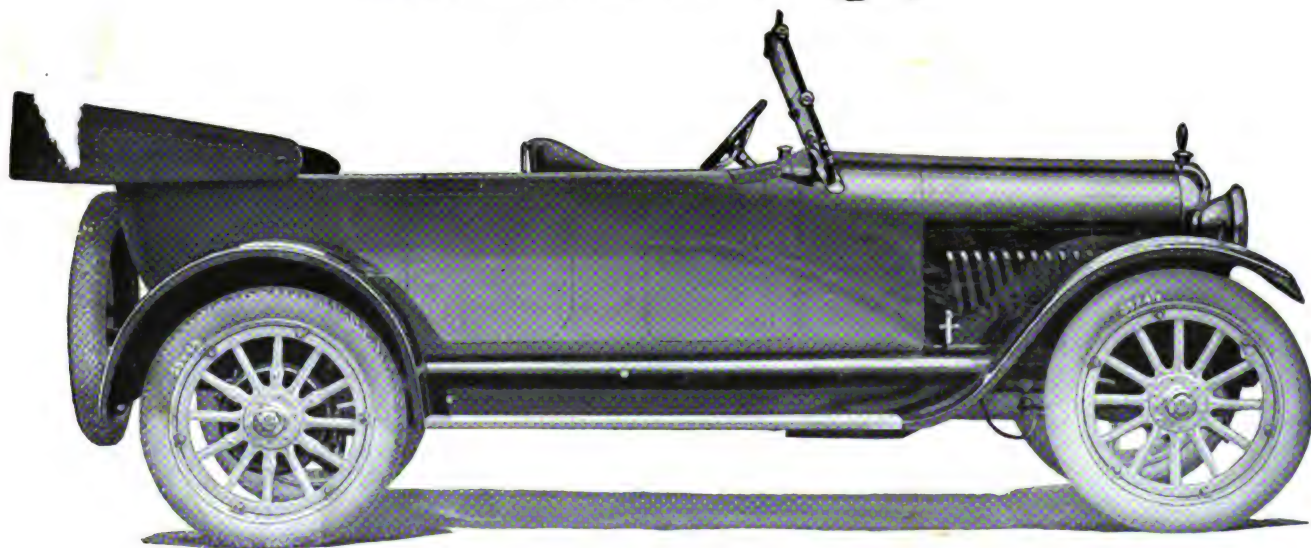
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VOL. XXII

NO. 3

PAIGE

The Standard of Value and Quality



*The New Series Fairfield "Six-46," \$1375 f. o. b. Detroit
The New Series Fleetwood "Six-38," \$1090 f. o. b. Detroit*

That Mt. Hood Climb—And Some Remarkable Conclusions

UNDoubtedly you have already heard of the amazing ascent of Mt. Hood, near Portland, Oregon, by a Paige Fairfield "Six-46." But let us review the details of that astounding feat:

On July 10th this Fairfield—a stock car in *every respect*—began the battle to do what no motor car had ever done. No car had ever succeeded in getting farther up the rocky, snow-clad side of Mt. Hood than half-way between Government Camp and timber line. On July 10th, the Paige Fairfield reached Government Camp, and won the Pridemore Silver Cup for the first car of the season to reach Camp.

Then the car went on and up. Sheathed in ice, the car battered its way through snow-drifts, crossed a crevasse 2000 feet deep, toiled up 50 per cent grades, and finally, before a sheer wall, stopped at an elevation of 9500 feet above sea-level.

That was three quarters of a mile beyond timber line. That was three miles farther up the mountain side than any motor car had ever gone. The Fairfield had accomplished a feat declared to be impossible, and accomplished it without a single mechanical adjustment or replacement.

This record-breaking achievement was conceived, planned and executed by a Paige Dealer. He knew, of course, that Mt. Hood is a favorite testing ground

for motor cars of all horse-powers, all prices. He knew the terrific conditions—the dangers which confronted him, the chances of failure.

And he had enough confidence in the power and stamina of the Paige Fairfield to attempt this tremendous and supposedly impossible feat—in a stock Fairfield.

That shows the faith, the loyalty, the enterprise of Paige Dealers. That shows what they think of Paige cars. To more than a thousand of the most successful dealers of the country the Paige line is a big business asset which they are eager to secure, to develop and to keep.

They know that there is money in selling a car like the Paige—a car that once sold brings back no regrets to owner or dealer—a car that is easy to sell and, better yet, stays sold—a car that shows the dealer a handsome profit, and by "standing up" under the most gruelling conditions avoids the expense of service and lets the Paige dealer keep his profit.

This Mt. Hood climb is even more than overwhelming proof of the stamina of Paige cars. It is proof of the strength, the character and the indomitable spirit of the whole Paige organization.

That means much to us. And it should mean much to every alert motor car dealer in the country.

PAIGE-DETROIT MOTOR CAR COMPANY, DETROIT, MICHIGAN



The Latest
Willys
KNIGHT
 Motor Cars
Sleeve-Valve Motor
 Model 88-4
\$1285
J. O. B. Toledo

Brief Specifications

New double cowl body
 40 horsepower four cylinder sleeve-valve motor
 121 inch wheelbase
 Seven passenger seating capacity
 34x4 1-2 inch tires—non-skid rear

Cantilever rear springs
 Auto-Lite starting and lighting system
 Electric switches on steering column
 Vacuum tank fuel feed
 Gasoline tank and gauge in rear
 Moto-Meter

Reviewing a Great Success —and Its Successor

Just about one year ago the whole country was sitting on edge in anticipation of our introducing the sleeve-valve Knight-motored cars.

So thousands of people who were on the verge of buying other cars—waited.

From our initial announcement alone our production was oversold for six months.

On all sides people were astounded at the Willys-Knight performance.

The smoothness of operation; the practical elimination of gear shifting; the absence of carbon troubles; the giant power, coupled with extreme quietness; its economy and all

around simplicity immediately established a new standard of motor car efficiency.

Of the sleeve-valve motor we need say but little. In the hands of tens of thousands of owners it has stood up and delivered far in excess of any of our descriptions or claims.

Probably the most distinguished feature of the new Willys-Knight is the striking body design.

The body is much longer—and lower. It has that fashionable double cowl feature. The new harmonious and graceful lines now make the Willys-Knight one of the most attractive motor cars of the year.

The wheelbase has been lengthened to 121 inches.

It now seats seven passengers.

The rear springs are now cantilever—the easiest riding springs in the world.

The quiet spiral bevel drive gears are continued.

Finished in rich French Blue with battleship gray wheels, and highly polished aluminum fittings, this newest Willys-Knight is now one of the country's smartest motor cars.

Demonstrations now.

The Willys-Overland Company, Toledo, Ohio

Made in U. S. A.

This Issue, Through the Hudson Valley to Plattsbur

AUTOMOBILE JOURNAL

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\$1.50 the year

VOL. XLII.

SEPTEMBER 25, 1916

NC



AC Plugs Regular Equipment on these Cars

Packard
Pierce-Arrow
Cadillac
Marmon
Hudson
Chalmers
Hupmobile
Chandler
Haynes
Chevrolet
Dort
Cole
Reo
Paige
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Stearns-Knight
Saxon
Stutz
National
Velie

Buick
Oakland
Oldsmobile
Jeffery
Jackson
Apperson
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Detroitter
Paterson
McFarlan
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Enger
Lexington-Howard
Brockway Truck
Chase Truck
Daniels
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Federal
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Kissel Kar
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Murray
Bour-Davis
Premier
Knox
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Monroe
Netco Trucks
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Pilot
Sayers-Scovill
Crane-Simplex
Singer
Stephens
United Truck
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Liberty

OWNERS! The men who OK the equipment of the most efficient cars built, have, after the most exhaustive tests known to engineers, placed their seal of approval on AC Spark Plugs by equipping their cars with AC plugs. Take advantage of their judgment, make sure your car is AC equipped.

Accept no spark plug unless it has AC burnt into the porcelain

Champion Ignition Co., Flint, Mich.

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AC

The Standard Spark Plug of America



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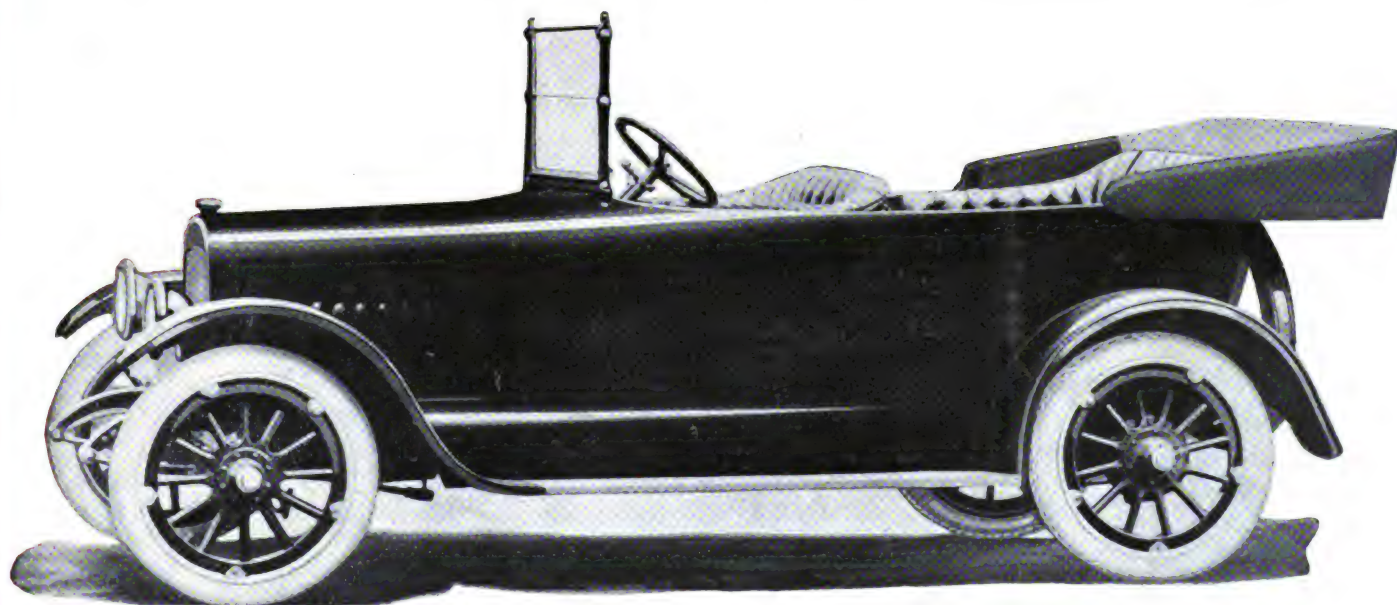
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VOL. XLII

OCTOBER 10, 1916

NO. 5

**IN SIZE AND POWER REGAL
TOPS ANY VALUE AT SIMILAR PRICE**



Regal-4-thirty-two

Last week we quoted authoritative tabulations from "Motor World", to show that the S. A. E. power rating was higher, that the wheelbase was longer in the Regal-4-Thirty-Two than in any other car selling between \$650.00 and \$750.00.

As to power we do not stand on the rating alone; we will back for performance in any kind of pull, over hill, sand or mud to prove its power performance.

As to size, not only does Regal's longer wheelbase and cantilever spring suspension give advantage of easier riding, but the design and arrangement of its cruiser-built body shows more seat-room in the tonneau than any other car selling from \$650.00 to \$750.00.

We believe that every dealer appreciates the sales value of statements that bear the light of comparative test.

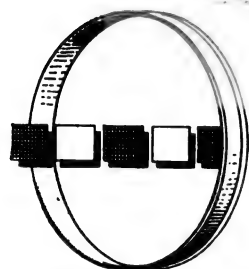
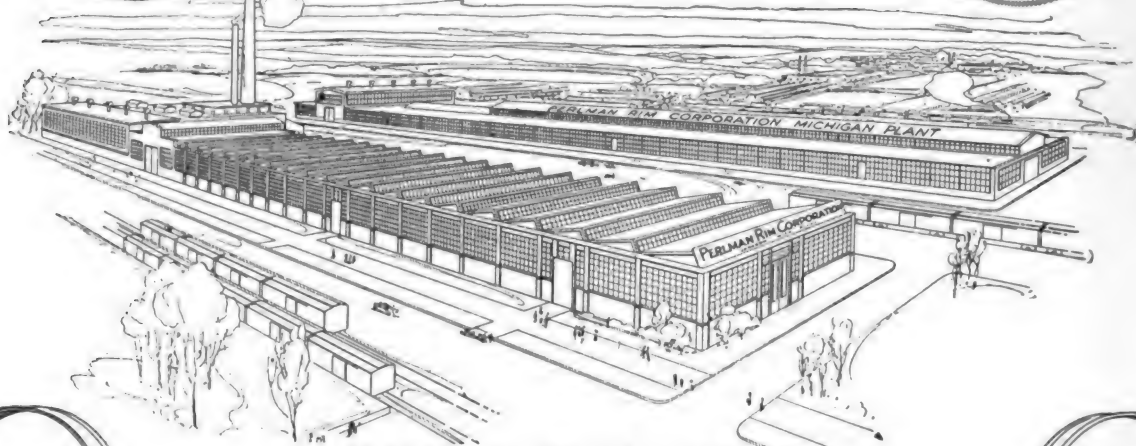
In the keen competition among cars that sell between \$650 and \$750, we believe that you appreciate the advantages of being able to make and prove tangible evidence of superiority, such as we have mentioned above.

If you are open to handle a car in this class, that you can stand behind as a leader in style, size and performance, write or wire us at once, as we may have some open territory on our schedule that will match your requirements.

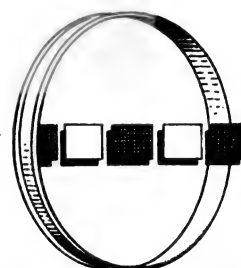
*Detachable head motor, 3½" bore, 4¾" stroke. 32 H. P.
Cantilever springs.
2 unit starting, lighting and ignition—magneto type.
Gasoline tank at rear, vacuum feed to motor.
Full Floating axle.*

\$695.00

REGAL MOTOR CAR COMPANY, (Dept. B) Detroit, Michigan



BIRD'S EYE VIEW
of the
PERLMAN RIM CORPORATION
JACKSON, MICHIGAN, PLANT



The largest and only exclusive demountable rim plant in the world, covering five acres.
The mechanical equipment is new and up to date, ensuring volume and quality production.
Producing five thousand sets of demountable rims every working day.
Enough to equip over one million, five hundred thousand (1,500,000) motor cars annually.
Prompt shipments of demountable rims in any desired size and quantity.

Perlman Patent Protection Policy Protects Purchasers.

Perlman, the Original Demountable Rims are—

FIRST in Quality, Quantity, Service, Saving, Economy, Efficiency, Use and Value—

We solicit your demountable rim business, inviting correspondence.

PERLMAN RIM CORPORATION

(Controlling Perlman Demountable Rim Patents)

MANUFACTURERS OF

Demountable Rims

Plain Clincher and all styles of Q. D. Demountable, Straight Side or Clincher

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and
Sales Department

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United States Rubber Co. Building
Broadway and 58th Street
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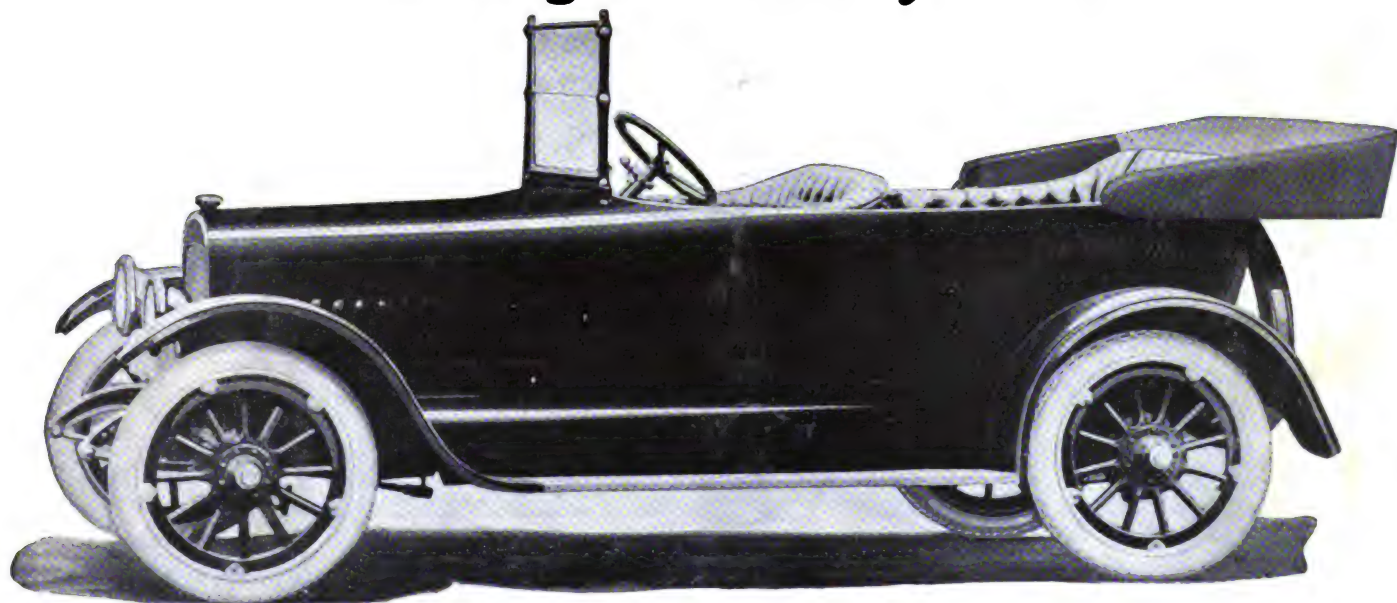
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VOL. LXII.

OCTOBER 25, 1916

NO. 6

Just a Few of the Selling Superiorities of the Regal 4-Thirty-Two



Regal 4-thirty-two

POWER—Regal's big motor shows a higher power rating (S. A. E. 19.6) than any other car selling between \$650 and \$750.

SIZE—Not only a longer wheelbase, but also wider sitting room in the tonneau (49 inches) than any other car selling between \$650 and \$750.

STYLE—Beautiful cruiser-built lines, permanent finish, and the latest mode of semi-gloss upholstery—a body model of distinction and luxurious utility.

Motor $3\frac{1}{2}$ " bore, stroke $4\frac{3}{4}$ ", detachable head—develops full 32 H. P.

Long wheelbase of 108 inches for unlimited comfort.

Gasoline tank at rear with Vacuum feed to motor.

Front seat 42 inches wide—rear seat 49 inches wide—cantilever springs.

2-unit starting and lighting system—magneto type. Furnished in very best grade semi-gloss upholstery. Fully equipped.

\$695

REAR AXLE—Full floating, of a sturdy design unusual in a car at this price.

GASOLINE SYSTEM—Generous tank at rear (14 gallons) with the up-to-date vacuum feed system—another exceptional feature in a low priced car.

There are still a few openings for dealers who are wide awake to the splendid selling opportunities of this attractive car. Write at once for details.

REGAL MOTOR CAR COMPANY, (Dept. B) Detroit, Michigan



Your Future

Are You Sure of it ?

YOUR line of fortune may indicate good luck : you may be one of those lucky mortals who seem to have the touch of Midas but your future---are you willing to gamble on that?

Auburn dealers are sure of their future, for it is based on something more tangible than a good line of fortune or accident. They know the Auburn is built by a company having eighteen years of successful manufacturing experience back of it; that real actual dollar for dollar value is built into each car; that they *always* have been accorded a square deal, and they know nothing succeeds like success.

How well we are assuring the future of Auburn dealers is ably demonstrated by the new models. These 1917 beauties are perfect exemplifications of the Master motor car builders art. No experiments, no fads, no freakish designs, just a wonderfully attractive car that performs as well as it looks. Specifications: Sure they are liberal, but please don't use that as your automobile yardstick. for Auburn automobiles are as different from cars of similar specifications and price as a Ruben's masterpiece is from its oleograph copy.

Auburn
LIGHT SIX **THE MOST FOR THE MONEY \$1085**

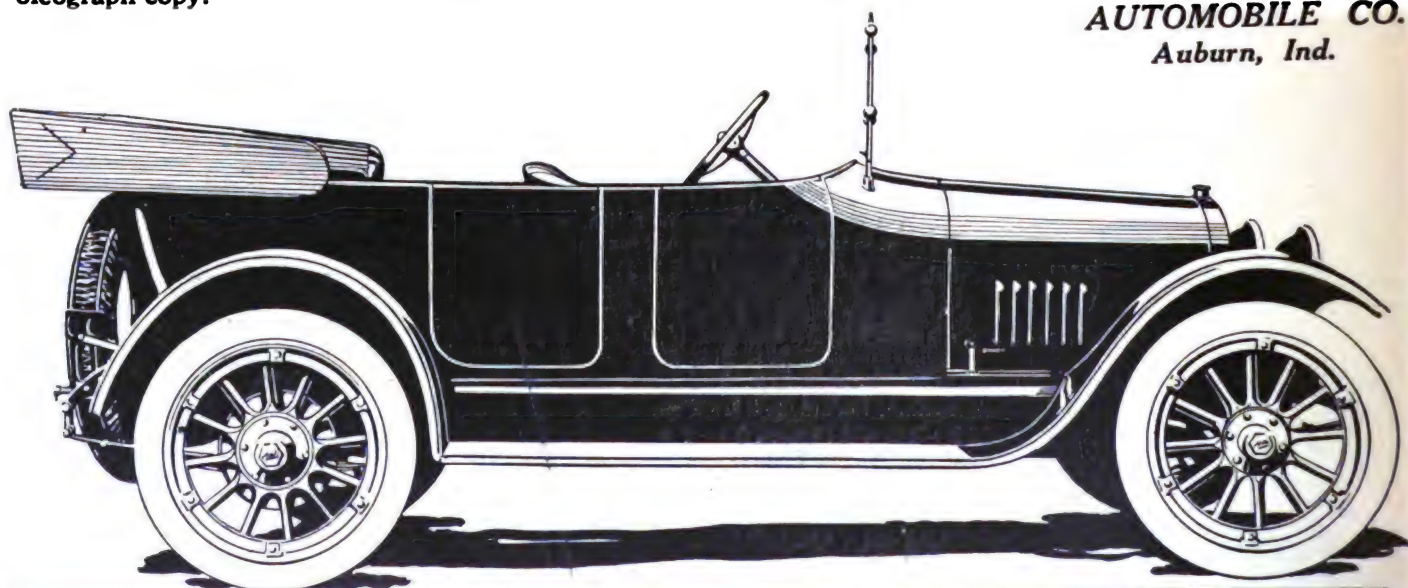
SPECIFICATIONS—LIGHT SIX—6-39

MOTOR: Six cylinder cast en bloc; 5 1-8x5.	SPRINGS: Semi-elliptic front and rear.
CONTROL: Left hand drive, center control.	WHEELS: 34 inches heavy artillery type, quick demountable rims, 34x4 straight side tires.
ELECTRIC SYSTEM: Two unit, six volt system producing current for lighting, starting and ignition.	COLOR: Royal blue—fenders, hood and flashings black enamel.
WHEEL BASE: 120 inches—10 1-2 inches clearance.	TYPES OF BODY: Five passenger touring car; Four passenger "Tete-a-Tete" Roadster; Roomy Roadster.
LUBRICATION: Combination force feed and splash.	EQUIPMENT: Complete.

Lastly, don't forget Auburn dealers are successful dealers. Their loyalty to the company is a source of amazement to those not within the circle. By becoming one You'll understand why, and profit, so act NOW.

Model 6-39, with detachable Sedan top . . . \$1260
Model 6-44, Seven Passenger Touring Car . . . \$1535

AUBURN
AUTOMOBILE CO.
Auburn, Ind.



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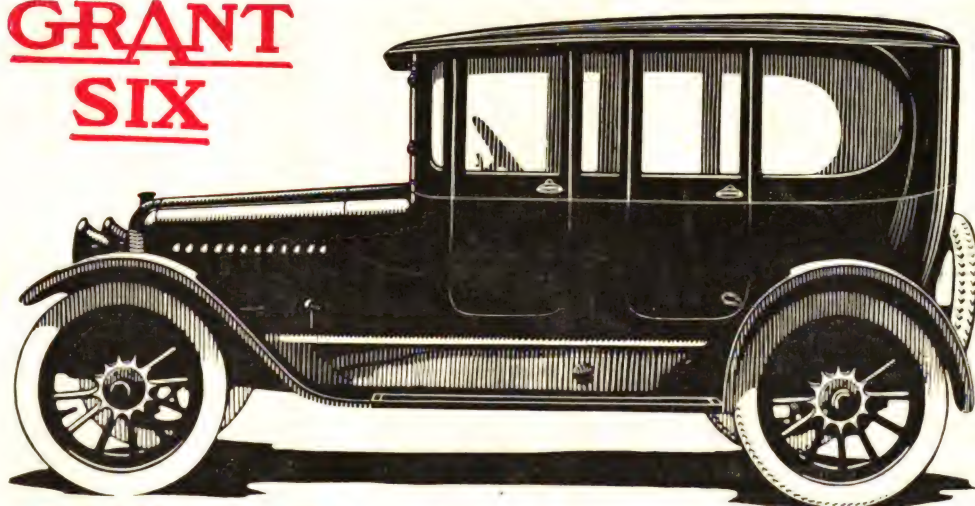
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VOL. LXII.

NOVEMBER 10, 1916

GRANT SIX



Utility—Plus Style and Comfort

This 1917 Grant Six Sedan is an all weather, quick-change car. When Motorists in open cars are chilled and wet from the cold and snow or rain, your Grant Sedan or Winter Roadster will secure you warmth and comfort.

Here you have a high-grade Sedan of style and luxury which in the hot months may be converted easily and quickly into a cool, superior touring car.

The Grant Six is without question one of the greatest automobile values of the year. Comparison proves this. It is the snappiest, liveliest, quietest operating and best looking six ever sold for the money.

You should not deny yourself the comfort and pleasure of winter motoring in this product of designing and engineering genius.

Remember, in this car you have the famous Grant Six overhead valve Motor,—powerful flexible, silent and economical.

Five-Passenger Touring Sedan

\$1000

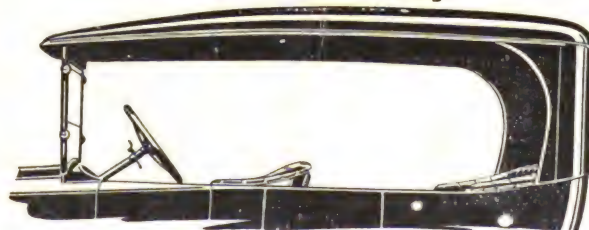
Three-Passenger Enclosed Roadster

\$960

F. O. B Factory

SEND FOR NEW GRANT LITERATURE, INCLUDING THE STORY OF "THREE ACHIEVEMENTS" JUST OFF THE PRESS

For Warm Weather Driving.



Sedan with Sash Removed.

GRANT MOTOR CAR CORPORATION

: : : :

FINDLAY, OHIO

We Will Protect Your Rights and Ours

**A Declaration of Intent and Determination
by the Fisher Body Corporation, the World's
Largest Builder of Automobile Bodies**

AN effort is being made to establish design patent rights to the commonly accepted type of Convertible "All Season" Automobile body.

If successful this effort would impose on the buyer of every motor car equipped with such a body, an arbitrary and, we believe, an unjust tax.

We deny the right of any organization or individual to levy such a tax, and we herewith announce our determination to resist with every means at our command any action which may be brought against us to this end.

We believe that, in this stand, we also represent the just rights of every motorist, every motor car dealer and every motor car manufacturer.

Here Are The Facts

Our position is based on our belief that this effort is unwarranted in view of the prior history of the art.

Coaches equipped with removable or collapsible side window structures were in common use long before motor cars became general.

Bodies of this type were mounted on European motor cars chassis more than ten years ago.

We ourselves have for some time built bodies of this type, following in our general designs the well-known and long established ideas of English and French body builders, as described and illustrated in technical journals, and confirmed by our own engineer's personal observations abroad.

We believe that these Fisher-built bodies, with which we supply the great motor car manufacturers of America, exemplify the highest degree of refinement yet given this well known type.

Even the hardware is Fisher-built.

Sashes throughout are of steel.

The glass sashes of doors and windows alike slide into recessed compartments at their base.

An ingenious detail permits partial opening of the glass sashes to any degree—a highly desirable advantage as compared with bodies whose sashes must stand either tight shut or wide open.

Each pillar is equipped with a lock and swivel hinge, permitting its complete removal and storage in a compartment under the seat, thus making every part of the body self-contained.

We have spared no effort to make these Fisher-built Convertible bodies absolutely noiseless. Padded compartments for panels and pillars combine with accurately fitted workmanship of the world's most experienced body builders to attain this end.

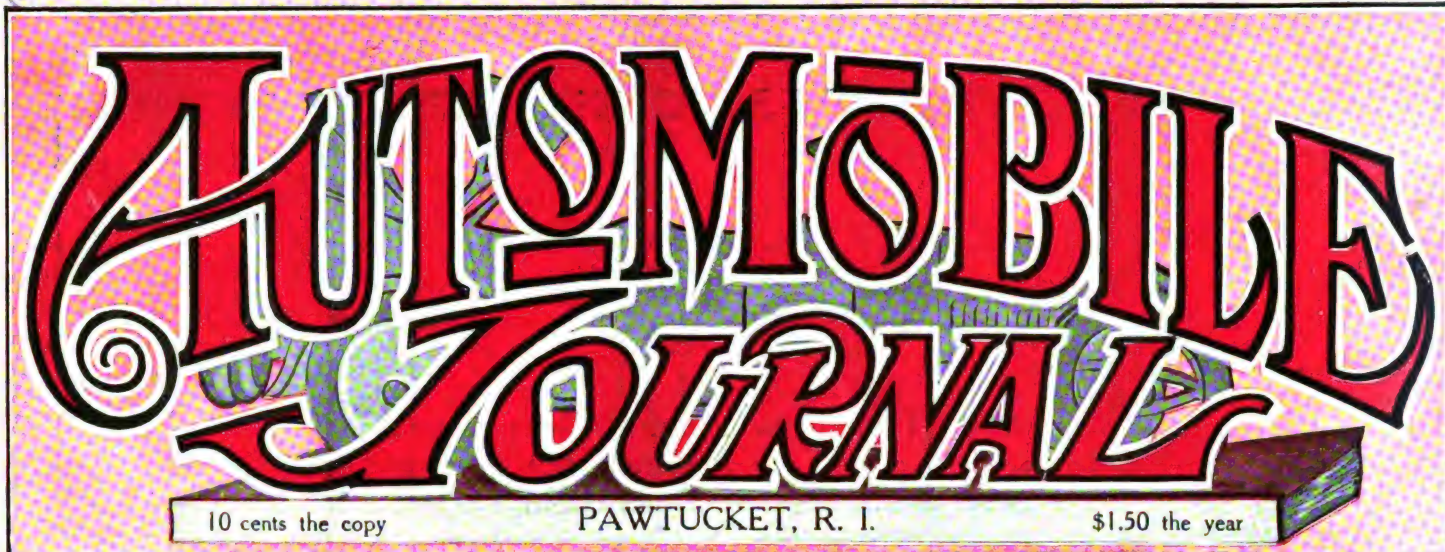
Our Future Course

We believe our pride in these bodies is justified.

We will continue to build them.

We will promptly defend ourselves against any effort to hamper us in their production or to compel us to sell them at an inflated price.

FISHER BODY CORPORATION
DETROIT, MICHIGAN



VOL. LXII.

NOVEMBER 25, 1916

NO. 8

1917 Show Issues of THE AUTOMOBILE JOURNAL

The most important editions of the year, covering each of the three big national motor car displays.

NEW YORK SHOW

(Held January 6-13)

Advance Number, December 28

Containing complete specifications data of all the 1917 pleasure car models and feature articles of great value to owners and prospective buyers of vehicles.

Review Number, January 10

Containing complete analyses of the models shown, with descriptions of the late models held for announcement at the New York Show.

CHICAGO SHOW

(Held January 27-February 3)

Advance Number, January 28

Featuring those pleasure car models to be exhibited in Chicago and not at the New York Show.

Review Number, February 10

An important edition, containing descriptions of the new models and the accessories disclosed at Chicago.

BOSTON SHOW

(Held March 3-10)

Advance Number, February 28

Containing a complete forecast of one of the greatest and most significant of the national motor car shows.

Review Number, March 10

A recapitulation of the only combined national display of pleasure cars and commercial vehicles held in the United States.

Willys
SIX
Seven Passenger

\$1325
f.o.b. Toledo



**IT Gives You Greater Power
at the Normal Driving Speeds**

We have developed this Six cylinder motor to the point where it delivers its greatest power at normal driving speeds.

And the new Willys Six gives you 20 miles per hour at 768 r. p. m.—40 miles per hour at 1536 r. p. m. The excessive speed motors which deliver their highest power at 3000 or more r. p. m. may be all very well for the driver who wants high power at high speeds.

But excessive speed motors necessarily sacrifice power, pick-up and flexibility at ordinary driving speeds in order to gain them at racing speeds.

And they must also sacrifice economy and durability. Conceiving your needs to be greater six cylinder efficiency at normal driving speeds with ample power at any speed at which you care to drive

—We have attained it in the Willys Six compared with any other six cylinder car.
—higher power at normal driving speeds,
—faster pick-up at normal driving speeds,

—smoother climbing without having to rush the hills,
—greater smoothness in high gear at very low paces. The new Willys Six is a record making car—but it makes its records at ordinary driving speeds.

To match its record motor performances it was built also to ride easier than the best of the other sixes of its size—to set a new high mark in riding comfort. Long cantilever rear springs with a long wheelbase (125 inches) and large tires (35x4½ inches) provide an ease and luxury of riding hitherto unknown.

And low, deep-cushioned seats, built over improved seat springs—each spiral separately air-cushioned and checked against rebound—contribute further to the comfort of passengers.

Its smart, double cowl body design is the embodiment of grace and beauty.

The price, \$1325, makes this big seven passenger Willys Six a value unapproached in the fine car class.

See the Overland dealer today.

The Willys-Overland Company, Toledo, Ohio

"Made in U. S. A."

JAN 11 1917

AUTOMOBILE JOURNAL

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PAWTUCKET, R. I.

\$1.50 the year

XLII
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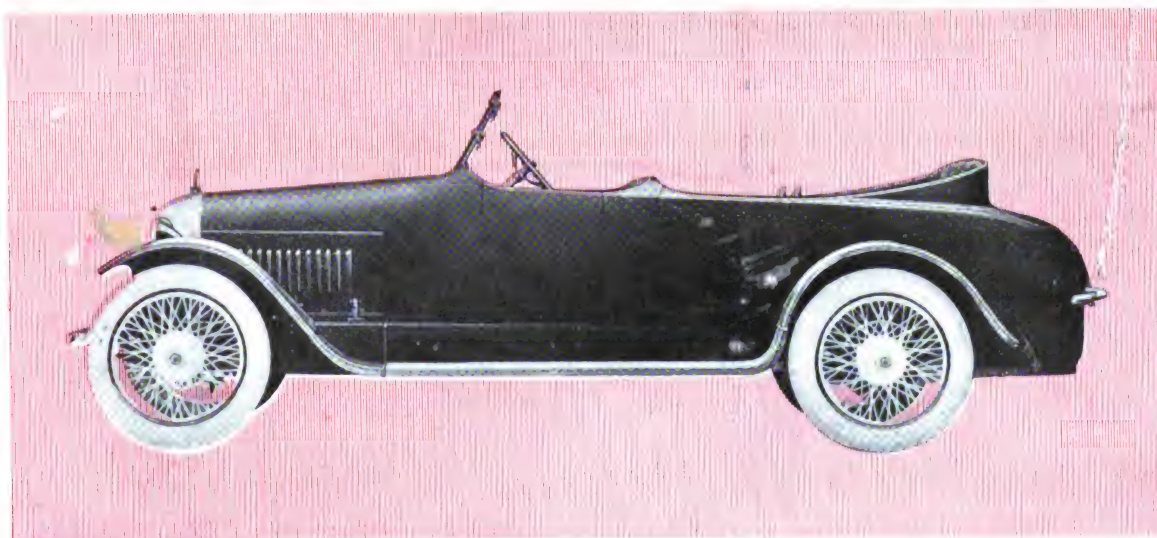
DECEMBER 25, 1916

NO. 10

Pathfinder

the "GREAT"

Seven Passenger
TOURING
ROADSTER



A Radical Departure In Motor Car Design

WITH the appearance of the Pathfinder Seven-Passenger Touring Roadster the conventional type of motor car has immediately become antique. Radical and daring in its originality, the new Pathfinder breaks with tradition and takes its place as the dictator of a new trend in motor car design.

Its two most conspicuous features are the disappearing top and the concealed spare wheel and tire—two of the most logical innovations ever made in the automobile body.

But a second glance shows that the new Pathfinder is the expression of something more than merely superficial smartness.

It is the first successful attempt to express the spirit of the automobile, to visualize in every line—**POWER, FLEETNESS AND SAFETY.**

The high, massive, square lined hood suggests the power of the wonderful twelve-cylinder engine underneath—an engine that is unmatched for flexibility, power range and economy.

The narrow V shaped radiator, the sloping windshield, the streamline body, the wire wheels suggest fleetness; the high body, sides and body are eloquent of comfort.

In a car that is probably the fastest stock touring car that is built, safety demands the lowest possible center of gravity. In this respect the new Pathfinder challenges the whole field.

\$3250

It is the car of physical and mental comfort, a masterpiece of style and luxury and destined to be the most talked of car in America.

THE PATHFINDER COMPANY
The Surprise of the New York Show

INDIANAPOLIS, U. S. A.

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THE TENTH

TEN YEARS HAVE



ANNIVERSARY

TESTED IT



TEN years are but a small part of a man's life, but ten years contain almost all the history of motor car making.

Ten years—how many of those whose name-plates are familiar to you were blue-prints, or even dreams, ten years ago.

What did you think a motor car should be ten years ago? Would you buy one of them today?

Ten years ago the Regal motor car was born. Some cars born that year are still going. Others are gone.

The Regal was a good car then—it has always been a good car. It is a good car today.

Put the Regal of 1907 alongside the Regal of 1917. Different? Yes. But not in the spirit of the builders—only in the experiences which the car embodies.

Ten years of succeeding—experiencing—packed-full-of-learning years—they have all gone into the Regal of 1917.

It is a Four; it is one model only.

Why Four? Because—well, in short because the auto engineers of the whole world say the four is the motor for the moderate-sized economical car.

Ten years say so. The user says so, too—and that alone is sufficient.

Advertising may put the name of a car in the mind of the buyer. The dealer may place the car in his hands, but only the car itself will ever get into a driver's heart.

There are a lot of cars that have happened—more will happen—but ten-year-old motor cars do not happen.

Not one of the elements which any motor car buyer ought to consider in this year of 1917 is absent from this sturdy car with its ten years of Thinking—Doing—and Arriving, behind it.

Ten years have tested it—many thousands owners have taken the road “kinks” and driver-devilttries out of it.

It is a driver's car. It is a dealer's car. It is the busy-on-the-road answer to the question—What has the ten years taught the Regal? Go and see it—ride in it—it will be its own answer.



From the Dealer's Viewpoint

The Regal 4-Thirty-Two is a great Dealer's car because it is a great Drivers' car.

It goes right to the heart of the common-sense, motor-wise American who wants economy, of course—performance, certainly—but who has also learned the wisdom of consulting his self-respect and his pride of appearance.

Comparison alone will prove the full truth of this. Look us over. You will find us on the show circuit from coast to coast.

Every Point Has a Strong Selling Appeal.

One Model—32 horsepower—a reserve force for any emergency—that's what makes it the pluggier—4-cylinder motor, built in our own shop. 3½" bore by 4¾" stroke.

Wheelbase—108". This is a longer wheelbase than any car in its price class—an assurance of ample room and riding comfort for five people.

Design—A wide doored, cruiser-line body, with high, narrow, sloping radiator and full flowing stream lines. Look at the illustration above. The seats are extra wide—upholstery deep and generous—assured comfort for five people. Fenders crowned, harmonizing with the body lines.

Operation—It is a Driver's car, also. That means accessibility—easy gear shift and brake control—convenient dash button starter. All dash instruments within reach and visible to driver. 14-gallon gasoline tank at rear of Chassis. Vacuum feed to motor.

A Car of Proven Performance.

Dependability—This Tenth Anniversary 1917 REGAL is a car of proven performance. This model differs in no essential respect from the 1916 REGAL, which this summer went through a special Performance Test by REGAL dealers and has stood up without a flaw in user's hands.

Chassis—Simplicity—rigidity and ruggedness mark its design. Cantilever springs make all roads smooth.

Equipment—Two unit starting, lighting and ignition system. Electric headlights with dimmer attachment, electric dash lamp and tail light, electric horn, one-man Mohair Top with slip cover, speedometer, battery indicator on the cowl board, rain vision, ventilating windshield, demountable rims with one extra rim, tire holder at rear, complete set of tools with jack and tire repair outfit and pump.

Write for Our Dealer's Proposition and Detailed Specifications.

Compare them with anything on the market at anywhere near the price, and see for yourselves if we might not truthfully say

“Here is a real car made for dealers to sell.”

REGAL MOTOR CAR CO.,
DETROIT, MICHIGAN

**STYLE
POWER
COMFORT
RELIABILITY
ECONOMY**

\$745

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VOL. LXII.

JANUARY 10, 1917

NO. 11



OFFICIAL JOURNAL

The publisher of the AUTOMOBILE JOURNAL announces to its 20,000 readers that beginning with the January 25 issue, and continuing through the year 1917, this publication will be the Official Journal of the

National Automobile Association

(Legal)

National Highways Association

(Highways)

Touring Information Bureau of America

(Touring)

These organizations place at the command of motorists exceptional benefits. The published information, which will appear in a special editorial section, will reach every subscriber as a department of the magazine. Subscribers are assured that it will be authoritative and of a character that can be obtained only from highly trained specialists.

AN agency for Hood Tires is a valuable asset to your business because—

The Hood Tire is of such supreme quality that every sale means repeat orders and an increasing patronage through recommendation.

Our national advertising in newspapers, the *Saturday Evening Post* and other widely read magazines will send the right kind of buyers to where the Hood sign is prominently displayed. Write us regarding our exclusive agency proposition.

THIS IS THE SIGN OF A HOOD DEALER



**“Quality
is
Economy”**

Hood Tire Co., Inc., Watertown, Mass.

AUTOMOBILE JOURNAL

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VOL. LXII: 1/1

JANUARY 25, 1917

NO.



ANNOUNCEMENT

OFFICIAL JOURNAL

National Automobile Association
(Legal)

National Highways Association
(Highways)

Touring Information Bureau of America
(Touring)

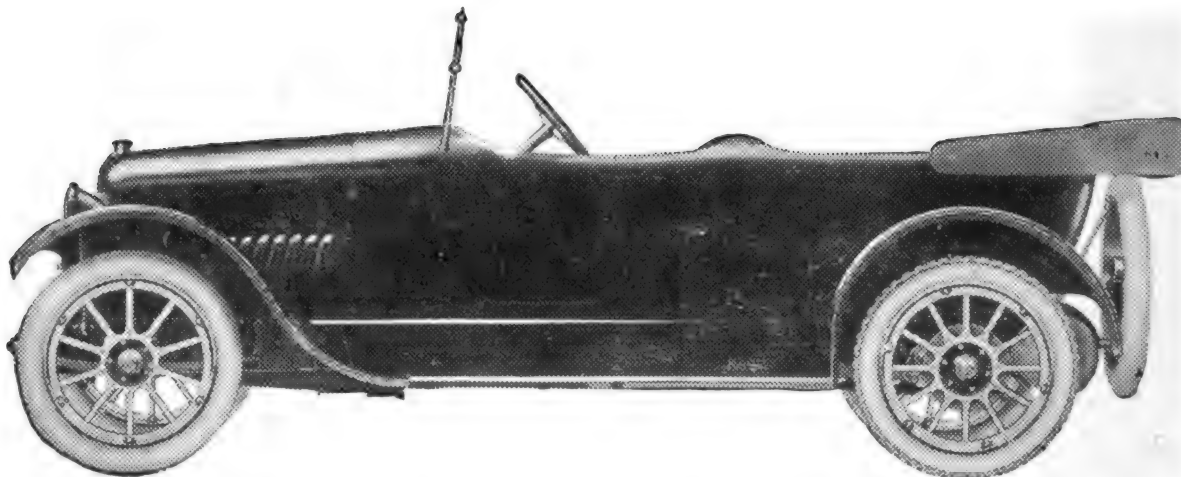
The 7500 Members of the National Automobile Association are all paid-in-advance bona fide subscribers of The Automobile Journal. The circulation of this magazine is now in excess of 23,000 copies the issue.

The products advertised in this Journal are endorsed by the management of the National Automobile Association to all its members.

\$350,000 worth of cars, equipment and supplies were bought by National Automobile Association members in 1916—with the increased membership in 1917 the members will spend more than \$500,000.

Do you want the National Automobile Association's endorsement and your share of this business?

BOSTON SHOW NUMBER, February 27.
Make Reservation Early.



“The Car of the Hour”

5-Passenger Touring

\$985

Elgin Six

4-Passenger Roadster

\$985

Distinction and Comfort

The Elgin Six is the only car in its price class having the fashionable center cowl of the high-priced European models. Its beautiful yacht line design was established by a famous artist and gives the Elgin Six a style and distinction that set it apart from the monotonous design of the average car.

Elgin engineers have perfected an improved rear spring suspension, found only in the Elgin Six, which sets a new standard of motoring ease and comfort at high speeds, reducing shock and vibration to a point not surpassed in any car at any price.

The special construction of the Elgin velvet-acting clutch enables the Elgin Six to be started at high gear, under ordinary conditions, eliminating to a large degree the necessity of gear shifting, *thus removing the last barrier to the safe and easy handling of a motor car by women.*

Endurance and Economy

The Elgin Six, now in its second triumphant year, has stood “The Acid Test” by winning perfect scores and highest honors in some of the most gruelling endurance and economy runs of the past year.

Three Elgin Sixes, on a hard two-days’ run under the auspices of the Chicago Motor Club, made perfect scores and averaged 25.6 miles to the gallon of gasoline.

The Elgin Six has just established a new record of 1,626 car-racking, stamina-testing miles, in 67½ hours, between Chicago and Miami, Fla.

Thirteen hours of this time was driven in a heavy rainstorm that made the roads slippery and dangerous, and in some places so deep and

heavy with mud that the average car could not negotiate them at all.

The route included the steep, rocky mountain grades of Kentucky and Tennessee, the heavy sands of Georgia, and the slimy, treacherous swamp roads of Florida.

An Elgin Six touring car won a race against a fast express train through the wilds of Minnesota and Dakota, over roads that in some places were little better than a mere rocky trail, covering 552 miles without mechanical adjustment and without a single stop of the motor.

Many other remarkable Elgin performances have firmly established the Elgin as a *mechanical masterpiece*, and the champion for long sustained speed, endurance and economy.

IMPORTANT TO DEALERS—The completion of our big, modern, daylight Plant No. 2 has so increased our production that we are now entering new territory. Yours may be open. Better wire us for application blank and full particulars of 1917 best money-making proposition for dealers.

Elgin Motor Car Corporation, Chicago, U. S. A.



LONGEVITY

The purchaser of a Pierce-Arrow secures a car of life-long durability at a cost which, when spread over years of service, over continents of travel, is insignificant. Its natural age is greater than that of lesser cars, just as the natural age of the oak is greater than that of the birch. It has not yet realized all of its potential mileage because it is still too young. Frequent requests for instruction books for Pierce-Arrow cars built eight, nine or ten years ago show that cars at least that old are starting service anew in the hands of new owners.

THE PIERCE - ARROW MOTOR CAR CO - BUFFALO N Y

PIERCE- ARROW

Nearly a Million FORDS on the Road
Help KEEP them on the Road by Using

MOSSBERG WRENCHES

And Special Tools for FORDS



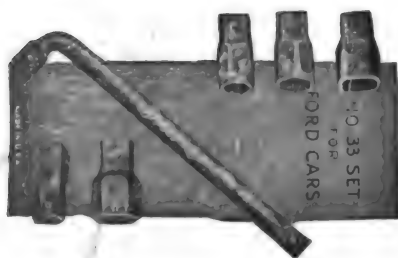
No. 17 Set—Heavy duty for Ford. 10 sockets, including those special sockets for spark plug, rear axle housing and cylinder head nuts. Price each, \$2.00.



No. 30 "Ideal" Set for Fords. 10 sockets, including all special sizes. Ratchet handle, universal joint and extension bar. Price each, \$4.00.



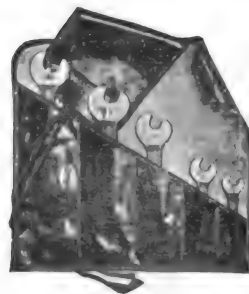
No. 15 "Major" Set—Covers all adjustments on Fords, including reversible ratchet handle. Price each, \$5.00



No. 33 Set—A small, forceful set for packing under the seat. Five special sockets and double-end offset handle. Price each, \$1.10.



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